West 2071
Installation & Operating Instructions

MP MASTER
MA35952

WEST 2071

MICROPROCESSOR-BASED CONTROLLER

INSTALLATION AND OPERATING INSTRUCTIONS

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NOTE

Our policy is one of continued improvement, and consequently the information contained in this publication may differ in some respects from the instrument in question. Therefore this document does not constitute an offer or part of an offer for sale.

CONTENTS

SECTION 1 - HOW TO USE THIS MANUAL

SECTION 2 - INTRODUCTION

SECTION 3 - INSTALLATION

3.1 Unpacking

3.2 Mounting and Removal

3.3 Wiring

3.4 Mains (Line) Supply

3.5 Input

3.6 Output 1

3.7 Output 2

3.8 Alarms

3.9 RS422 Connections

3.10 Inductive Loads

SECTION 4 - OPERATING INSTRUCTIONS

4.1 Introduction

4.2 Front Panel indicators and pushbuttons

4.3 Operating the instrument

SECTION 5 - SETTING UP PROCEDURES

5.1 Controls and Indicators

5.2 Setting up

5.3 Alarms

5.4 RS422 Operation

CONTENTS

SECTION 6 - FAULT FINDING

SECTION 7 - RE-RANGING AND RECONFIGURING

7.1 Tools Required

7.2 Dismantling the Controller

7.3 Link Jumpers

7.4 Inputs

7.5 Outputs

7.6 Alarms

7.7 Thermocouple Break Protection

7.8 Mains (Line) Voltage

7.9 CPU Link Jumpers

7.10 Re-assembling the Controller

APPENDIX 1 - SPECIFICATION

APPENDIX 2 - PRODUCT CODES

APPENDIX 3 - REPLACEMENT ASSEMBLIES

SECTION 1 HOW TO USE THIS MANUAL

This manual is divided into six main sections. It is structured so that the extreme flexibility of the instrument can best be utilised for each specific application.

For most applications, once the instrument has been installed and set up, it will only be necessary to refer to Section 4 (Operating Instructions).

A brief description of the contents of each section is detailed below:

SECTION 2 INTRODUCTION - contains a brief general description of the instrument.

SECTION 3 INSTALLATION - contains step by step information for wiring and installing the instrument. This section is intended for use by an installation engineer who is conversant with local requirements regarding electrical installation.

SECTION 4 OPERATING INSTRUCTIONS - contains a description of all the front panel controls, indicators and facilities for an instrument where the adjustable parameters have been pre-defined and adjusted. It assumes that the instrument has been installed, and set up, and that the parameters have been locked for a specific application. This section is intended for personnel who are responsible for operating the system after it has been set up.

SECTION 5 SETTING UP PROCEDURES - contains a more detailed description of the front panel controls, indicators and facilities, together with setting up procedures. This section is intended for use by an engineer who is conversant with the application and facilities offered by the instrument.

SECTION 6 FAULT FINDING - contains first line fault finding procedures which allow a malfunction to be identified. This section is intended for use by maintenance/service personnel.

SECTION 7 RE-RANGING AND RECONFIGURING THE INSTRUMENT - contains changes which may be made by altering the appropriate link jumper positions.
This section is intended for use by an instrument technician.

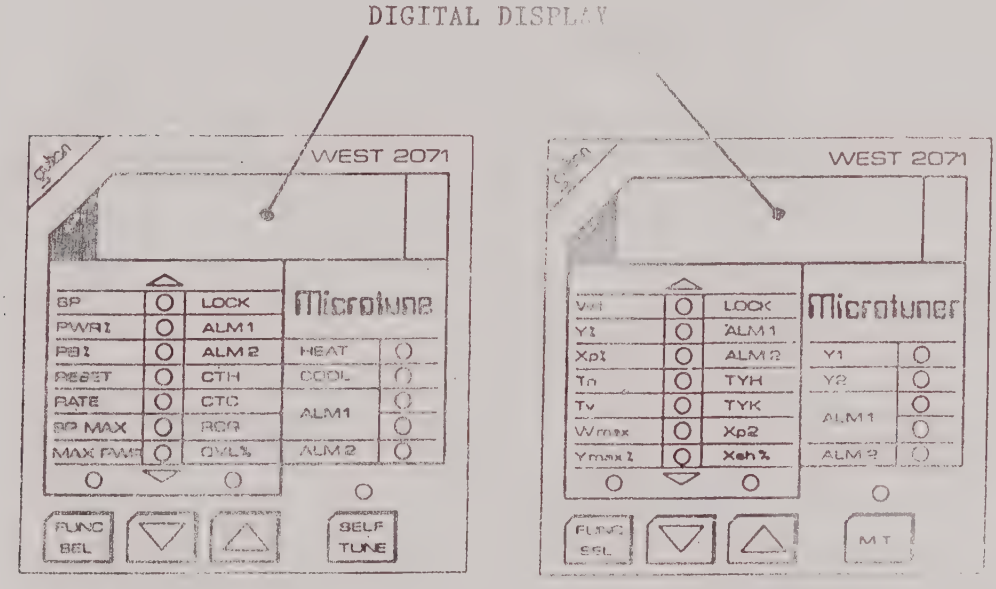
APPENDIX 1 PRODUCT SPECIFICATION

APPENDIX 2 PRODUCT CODE - contains the information which allows the instrument function to be determined from the product code. The product code is located on the top plate of the instrument.

APPENDIX 3 REPLACEMENT ASSEMBLIES - lists the alternative I/O PCBs and Option PCBs together with their Product Codes.

SECTION 2 - INTRODUCTION

The WEST 2071 is a high quality temperature controller which incorporates a self-tuning facility. The instrument is microprocessor-based and the software includes algorithms automatically adjust the control parameters to give optimum performance for a wide range of applications. The main features of the instrument are shown in the following illustration.



U.S.A. EUROPE

FIGURE 2-1 WEST 2071 FRONT PANEL

Digital display — Normal display is of the measured variable, e.g. temperature. Other parameters can be displayed by operating the JUNCTION SELECT pushbutton.

LED Indicators.

The instrument provides the following indicators.

1 Output 1 indicator (HEAT/Y1) — This indicates when power is applied to the external load connected to output 1. The indicator is non-functional if a linear, VMD or thyristor output is fitted.

2	Output 2 indicator (COOL/Y2)	This indicates when power is applied to the external load connected to output 2. This output is optional, (see Appendix 2, Product Code).
3	Deviation alarm (ALM1) indicator	Red indicator ON = alarm condition Green indicator ON = safe condition This output is optional (see Appendix 2, Product Code).
4	Process alarm (ALM2) indicator	Red indicator ON = alarm condition This output is optional (see Appendix 2, Product Code).
5	Deviation indicator display	This block of seven indicators has two separate functions: a) to display deviation from setp b) to indicate which function is presented on the digital display (used in association with the two yellow indicators).
6	Function select indicators	These two yellow indicators are used to select which bank of functions is in use. (With both yellow indicators off, the digital display is in the normal mode.)
7	Self-tune/MT indicator	When this LED is illuminated it shows that the controller is in Self-tune mode. When this LED flashes it shows that the controller is in Pre-tune mode.

Pushbutton controls —

1	Raise pushbutton	Used to increase the value of a function e.g. setpoint (SP/W1). If the pushbutton is held down the rate of increase automatically accelerates.
2	Lower pushbutton	Used to decrease the value of a function e.g. setpoint (SP/W1). If the pushbutton is held down the rate of decrease automatically accelerates.
NOTE		If RAISE and LOWER are pushed simultaneously the controller goes into 'Pre-Tune' mode.

3	Function select pushbutton	Enables the information for a particular function to be presented on the digital display. If the pushbutton is held down the instrument starts stepping through the functions until a return is made to the normal display mode.
4	Self-tune/MT pushbutton	...lects automatic tuning. In this mode whenever a change of load or setpoint occurs the program records the response of the controller and measured variable, and adjusts the proportional band, the integral, the derivative, and the relative gain to optimise the response.

SECTION 3 - INSTALLATION

3.1 UNPACKING THE 2071

The controller is supplied in its housing with two mounting bars and two mounting screws included in the transit package.

Remove the equipment from the transit package and check for damage. Notify the carrier immediately in case of any damage or deficiencies.

3.2 MOUNTING

The instrument is contained in a housing which can be mounted on a rigid panel of up to 6mm (.25 inches) thickness with a cut-out 92mm, +0.8 -0mm (3.62in, +0.03 -0in) square.

The instrument is 210mm (8.3in) deep; the front panel is 96mm (3.8in) square.

For replacement or servicing the instrument can be easily removed from the housing, leaving the housing and back-wiring attached to the mounting panel.

WARNING
The mains (line) supply must be disconnected from the instrument before attempting to remove it from its housing.

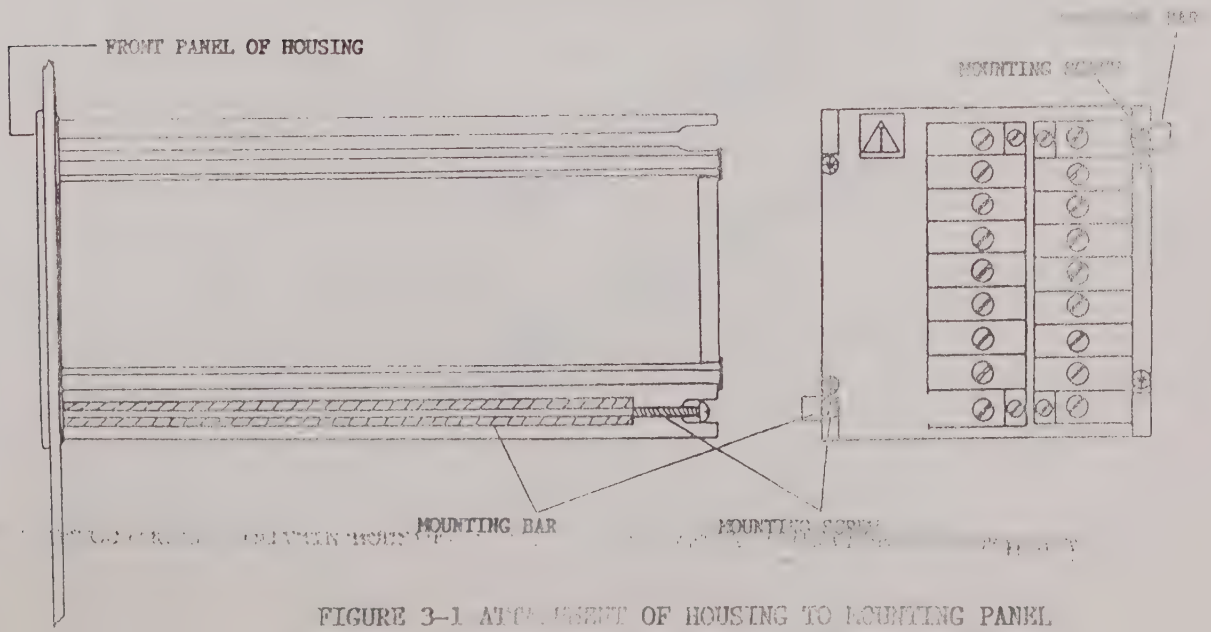


FIGURE 3-1 ATTACHMENT OF HOUSING TO MOUNTING PANEL

3.2 a) Attaching Housing to Mounting Panel

Insert the rear of the housing (or housing with instrument in it) through the cut-out and hold it lightly against the front panel.

The housing is held in place by two diagonally opposite mounting bars that slide into grooves along the side of the housing.

Mounting screws hold the mounting bar against the rear of the mounting panel as shown in figure 3-1.

Slide the mounting bars along diagonally opposite grooves and insert the screws along the grooves; gently tighten the screws to hold the housing securely against the panel.

3.2 b) Removal of Housing from Mounting Panel

Remove the mounting screws (shown in figure 3-1). Support the housing with one hand and remove the mounting bars by sliding them rearwards out of the grooves.
Remove the housing out of the mounting panel by pulling the housing forwards through the mounting hole.

3.2 c) Inserting Instrument into Housing

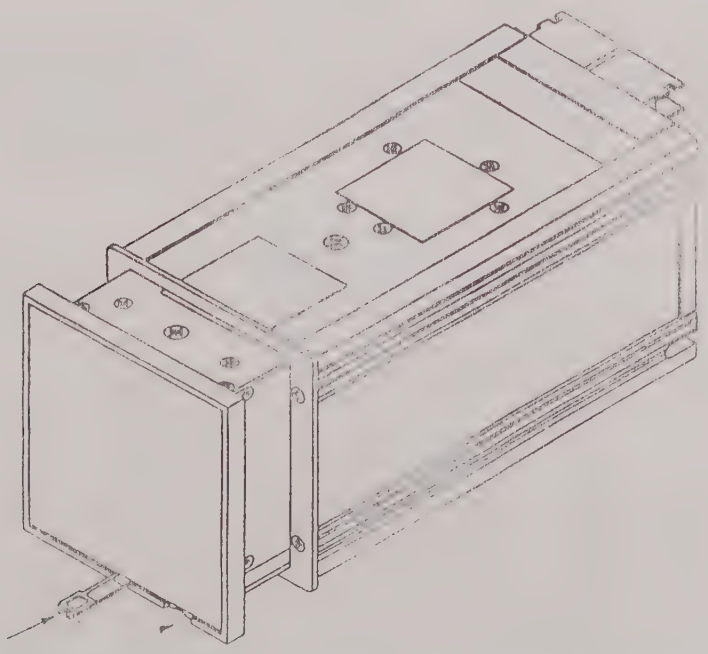


FIGURE 3-2 REMOVAL AND REPLACEMENT OF CONTROLLER WITHIN HOUSING

The hinged lever must be at 90° to the front panel of the instrument as shown in figure 3-2.

Carefully slide the the instrument into the housing previously mounted on the mounting panel. Firmly push it home so that the rear connections of the circuit boards make a good connection with the rear terminals.
With instrument fully inserted lock it in to place by pushing the lever so that it is flush with the frame.

3.2 d) Removal of Instrument from Housing

Insert a small screwdriver into the slot to the right of the hinged lever (see Fig. 3-2) Put a small amount of downward pressure on the handle to lift the small catch inside the slot. The hinged lever can now be pulled outwards to 90° to the front panel which releases the instrument and also unjacks the rear connections. Carefully pull the instrument out from the housing.

Note: **When the instrument is removed from its case, take care not to short circuit the terminals of the small lithium battery on the CPU card (right hand side of instrument viewed from the front).**

3.3 WIRING - GENERAL

Local requirements regarding electrical installation should be rigidly observed.

Ground terminals must be separately connected and not made common to the neutral. Consideration should be given to the prevention of unauthorised personnel gaining access to power terminations. Fig. 3-3 shows the rear terminal connections for standard instruments.

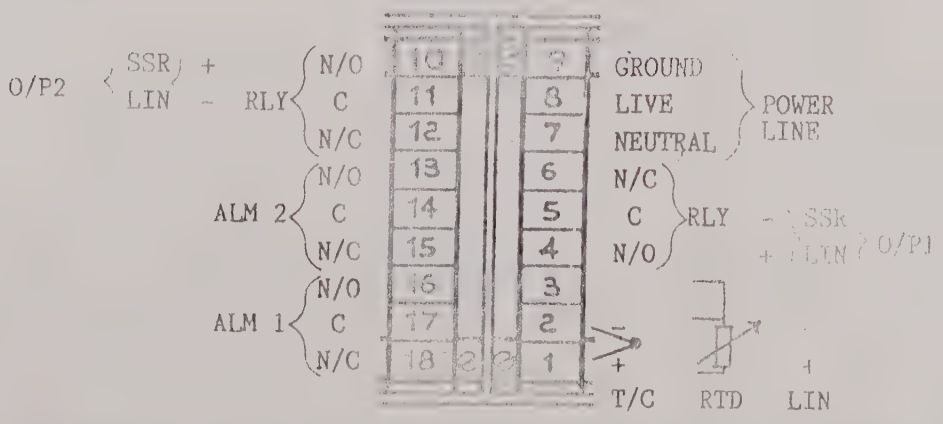


FIGURE 3-3 REAR TERMINAL CON[illegible] STANDARD INSTRU[illegible]

Figure 3-4 shows the rear terminal connections for instruments fitted with VMD output 1.

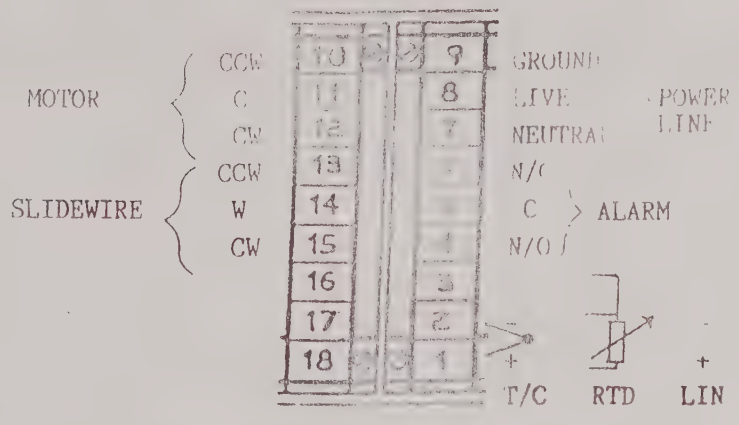


FIGURE 3-4 REAR TERMINAL CONNECTIONS - VMD OUTPUT INSTRUMENTS

Figure 3-5 shows the rear terminal connections for instruments fitted with thyristor output 1.

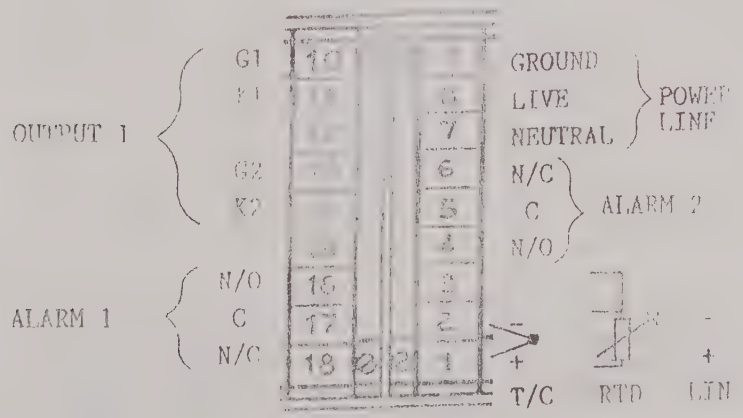


FIGURE 3-5 REAR TERMINALS CONNECTIONS - THYRISTOR OUTPUT

3.4 MAINS POWER SUPPLY

The instrument power supply can be 193-264V (Product Code L01), 100-132V (Code L02) or 24V (Code L04) 50/60 Hz.

It is recommended that the power supply includes a 1A slow blow fuse (3A for 24V operation) and a double pole switch.

The ground terminal 9 should be connected to a protective ground conductor before any wiring is made, and should remain connected at all times.

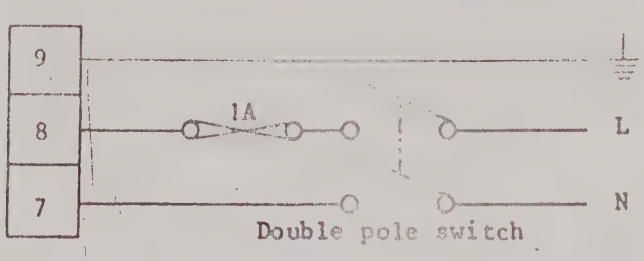


FIGURE 3-6 POWER SUPPLY CONNECTIONS

3.5 INPUT

3.5.1 Thermocouple (Product Codes T1---)

Thermocouple leads should be connected to terminal 1 (positive) and terminal 2 (negative). The correct type of thermocouple extension leadwire or compensating cable must be used for the entire distance between the instrument and the thermocouple, ensuring that the correct polarity is observed throughout. Joints in the cable should be avoided if possible. All instruments supplied with a thermocouple input have a cold junction compensation bobbin fitted across terminals 2 & 3. This bobbin should never be removed.

DO NOT RUN THERMOCOUPLE LEADS ADJACENT TO POWER CARRYING CONDUCTORS. IF THE WIRING IS RUN IN A CONDUIT, USE A SEPARATE CONDUIT FOR THE THERMOCOUPLE WIRING. IF THE THERMOCOUPLE IS GROUNDED, THIS SHOULD BE DONE AT ONE POINT ONLY.

THERMOCOUPLE LEADWIRE COLOUR CODES (last colour is overall sheath).

THERMOCOUPLE MATERIAL	BRITISH BS	AMERICAN ASTM	GERMAN DIN	FRENCH NFE
T Copper Constantan	+blue -blue blue	+blue -red blue	+red -brown brown	+yellow -blue blue
J Iron/Constantan	+yellow -blue black	+white -red black	+red -blue blue	+yellow -black black
K Nickel Chromium Nickel Aluminium	+brown -blue red	+yellow -red yellow	+red -green green	+yellow -purple yellow
R 13% Copper S 10% Copper Nickel	+white -blue green	+black -red green	+red -white white	+yellow -green green

FIGURE 3-7 THERMOCOUPLE INPUT CONNECTIONS

3.5.2 Linear Input (Product Codes T3---, T4---)

The leads should be connected to terminals 1 (positive) and 2 (negative). Copper leadwire should be used for these connections.

DO NOT RUN LEADS ADJACENT TO POWER CARRYING CONDUCTORS. IF THE WIRING IS RUN IN CONDUIT USE A SEPARATE CONDUIT FOR THE INPUT WIRING. IF THE INPUT WIRING IS EARTHED, THIS SHOULD BE DONE AT ONE POINT ONLY.

FIGURE 3-8 LINEAR INPUT CONNECTIONS

3.5.3 3-Wire Resistance Thermometer (Product Codes T2---)

The resistance element should be connected [illegible] 1 and 2, with the compensating lead connected [illegible] terminal 3. The extension leads should be [illegible] and the resistance of the wires connecting the resistance element should not exceed 100 Ohms per lead. (The leads should be of equal length.)

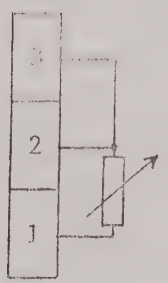


FIGURE 3-9 3 WIRE RESISTANCE THERMOMETER INPUT CONNECTIONS

3.6 OUTPUT 1

3.6.1 Output 1 – Relay (Product Code H10)

Contact rating 5A at 240V (resistive load).
See section 3.10

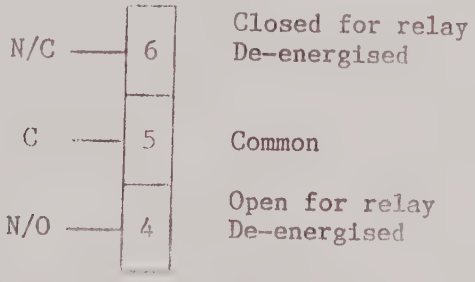


FIGURE 3-10 OUTPUT 1 RELAY CONNECTIONS
(NOT VMD INSTRUMENTS)

3.6.2 Output 1 – SSR Drive (Product Code H50)

Instruments with this output produce a non-isolated D.C. time proportioned signal for operating external solid state relays (which must have an isolated input).

FIGURE 3-11 OUTPUT 1 SSR DRIVE CONNECTIONS

3.6.3 Output 1 – Linear (Product Codes H21, H24, H61, H64)

Instruments fitted with this output produce an isolated D.C. current/voltage signal (for available ranges see Section 2).

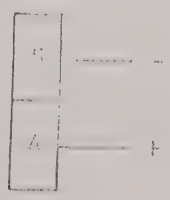


FIGURE 3-12 OUTPUT 1 LINEAR CONNECTIONS

3.6.4 Output 1 - VMD Output (Product Code H40)

Contact rating 5A at 240V (resistive load)
See Section 3.10

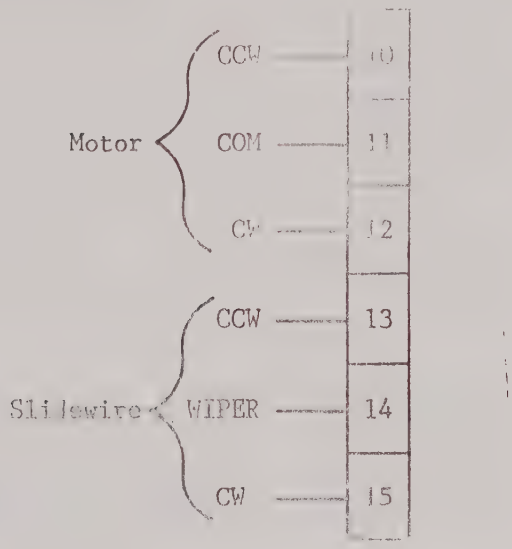


FIGURE 3-13 OUTPUT 1 VMD CONNECTIONS

3.6.5 Output 1 - Thyristor Pulse Output (Product Code H30)

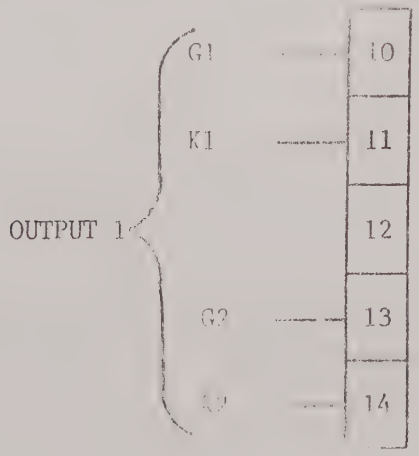


FIGURE 3-14 OUTPUT 1 THYRISTOR PULSE OUTPUT

3.7 OUTPUT 2

3.7.1 Output 2 - Relay (Product Code C10)

Contact rating 5A at 240V (resistive load)
See section 3.10

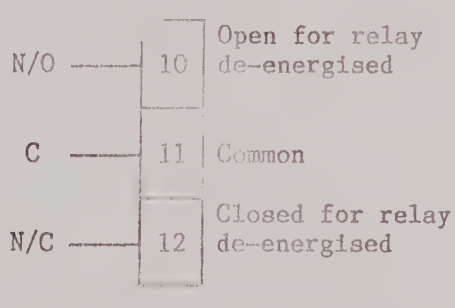


FIGURE 3-15 OUTPUT 2 RELAY CONNECTIONS

Output 2 is not available with VMD output or thyristor pulse output

3.7.2 Output 2 - SSR Drive (Product Code C50)

Instruments with this output produce a non-isolated D.C. time proportioned signal for operating external solid state relays (which must have an isolated input).

FIGURE 3-16 OUTPUT 2 SSR DRIVE CONNECTIONS

Output 2 is not available with VMD output or thyristor output.

3.8 ALARMS

3.8.1 Deviation Alarm – Alarm 1 (Product Codes C—42 to C—47)

Contact rating 2A at 240V (resistive load)
See Section 3.10

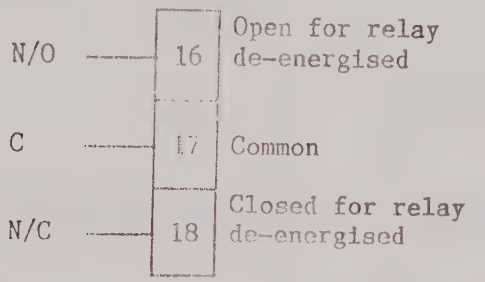


FIGURE 3–17 DEVIATION ALARM CONNECTIONS

Figure 3–17 is not applicable to VMD instruments.

3.8.2 Process Alarm – Alarm 2 (Product Codes C—48, C—49)

Contact rating 2A at 240V (resistive load)
See Section 3.10.

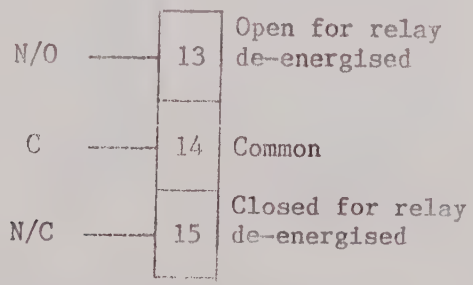


FIGURE 3–18 PROCESS ALARM CONNECTIONS
Figure 3–18 is not applicable to VMD or Thyristor instruments.

3.8.3 Alarm Connections for VMD Output Instruments and Process Alarm Connections for Thyristor Pulse Output Instruments.

When VMD Output 1 is fitted, only one of the following is available:

1) High deviation – direct acting (Product Code C—42)

2) Low deviation – direct acting (Product Code C—43)

3) Process alarm – reverse acting (Product Code C—49)

The process alarm is fitted as standard unless high or low deviation alarms have been specified.

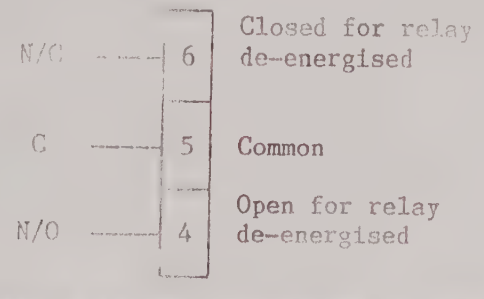


FIGURE 3-19 ALARM CONNECTIONS FOR VMD INSTRUMENTS AND PROCESS ALARM CONNECTIONS FOR THYRISTOR INTERFACE INSTRUMENTS

3.9 REAR TERMINAL CONNECTIONS FOR RS422

2071 Controllers which include the RS422 option have an extra terminal block on the back panel, as shown in Figure 3-20. Connections to other inputs and outputs remain the same as in the standard model.

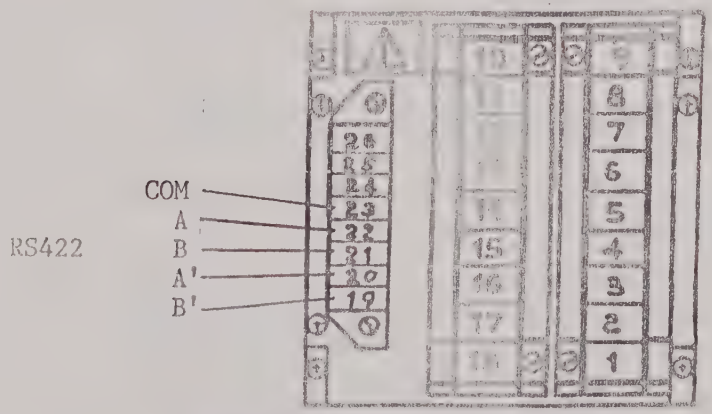


FIGURE 3-20 REAR TERMINAL CONNECTIONS FOR RS422 OPTION

Terminal 23 (Signal Common) is connected to the 0V line of a floating power supply in the controller, and this should be connected to signal common at the master end of the cable. With cable of less than 0.1 Ohms per metre (24 AWG, 25 SWG twisted pairs), the cable can be extended for up to 1 km.

Terminal A at the master should be connected to A' at the slaves(s) and B should be connected to B'; similarly A' at the master should be connected to A at the slave(s), and B' should be connected to B. Where multiple controllers are connected to one master port, the port transmitter must be able to drive a load of 12k Ohms per controller; the port receiver must have pull-up/pull-down resistors of low enough impedance to ensure it remains in the quiescent state while supplying up to ±100 microamps each to the controller transmitters in the high impedance state.

3.10 INDUCTIVE LOADS, EXTERNAL CONTACTORS AND MAINS OPERATED RELAYS AS LOADS

W A R N I N G

Operating the instrument with inductive loads and without the appropriate protection network may give rise to a hazard due to high voltage transients which may occur during the switching cycles.

3.10.1 GENERAL

The 2071 instruments contain an internal protection (snubber) network which provides adequate protection for resistive loads and inductive loads up to 40mA.

a) Higher inductive loads can cause the following problems if the recommended procedures as outlined in this document are not followed.

   1) Damage to the contacts of the internal relay(s) of the instrument

   2) High voltage transients that can damage the tracks with the possibility of a serio

   3) Radio frequency interference (RFI) which ca affect the performance of the instrument.

b) External contactors used as loads can (under exceptional circumstances) cause problems by failing to release. This can occur to a contacto which is of the very low current type so that th current through internal protection network capacitors is greater than the release current

c) Mains operated solid state relays can cause problems by 'holding on' due to the current through the internal protection network capacitors not allowing the input voltage to fall sufficiently to turn the device off.

d) The recommendations for the above situations are given for the following load applications:

   1) Inductive loads
      *Applications up to 40mA
      *Applications greater than 40mA

   2) Very low current external contactors

   3) Mains operated sol state relays

3.10.2 INDUCTIVE LOADS

a) **Applications up to 40mA**

The snubber network already fitted in the instrument provides adequate protection for inductive load applications up to 40mA

b) **Applications greater than 40mA**

Additional external protection components are required for inductive load applications greater than 40mA. For SPDT relay contacts these components are two capacitors and a resistor and are fitted in parallel with (and preferably close to) the load or across the instrument output, as shown in Figure 3-21. For SPST relay contacts (or if only one contact of an SPDT relay is used) the connections for the required capacitor and a resistor are as shown in Figure 3-22.

The required values for the components used for up to 240V a.c. applications are as shown in the following Table.

LOAD CURRENT	VALUE OF C uF	VALUE OF R ohms
70mA	0.047	22
150mA	0.1	47
0.5A	0.22	47
1A	0.47	4

NOTE: ALL CAPACITORS SHOULD CONFORM TO VDE (CLASS X) & BE SUITABLE FOR OPERATION AT 260V A.C

ALL RESISTORS (WIRE WOUND OR ALLAN BRADLEY TYPE [illegible]) SHOULD HAVE A MINIMUM RATING OF 2 WATTS

TABLE OF VALUES FOR PROTECTION NETWORK COMPONENTS

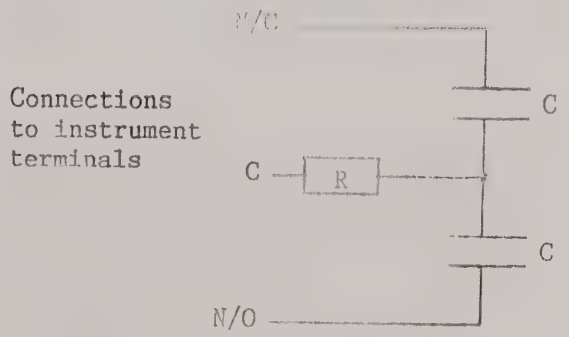


FIGURE 3-21 CONNECTION OF EXTERNAL PROTECTION COMPONENTS FOR SPDT RELAY CONTACTS

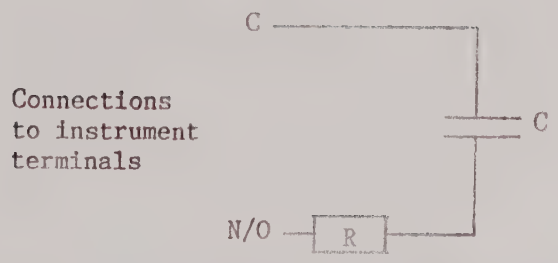


FIGURE 3-22 CONNECTION OF EXTERNAL PROTECTION COMPONENTS FOR SPST RELAY CONTACTS

c) External switch in series with an external inductive load

Damage to the instrument may result if unprotected switch, relay or contactor contacts are connected externally in series with the instrument relay contacts as shown in Figure 3-23.

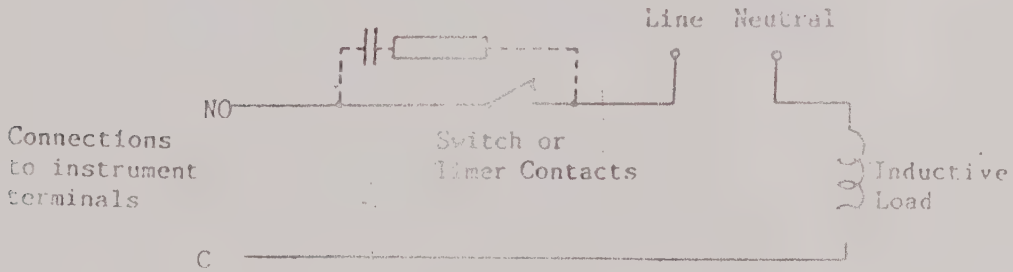


FIGURE 3-23 EXTERNAL SWITCH IN SERIES WITH AN EXTERNAL INDUCTIVE LOAD

Under these conditions the external contacts may operate while the instrument relay contacts are closed (i.e. the internal protection components short circuited and therefore ineffective).

In applications where it is necessary to fit external switch, relay or contactorcontacts in series with the instrument relay a snubber network must be fitted either across the inductive load or across the unprotected contacts. The values give in the table may be used.

d) Very low current contactor

In exceptional cases where the contactor requires a very low nominal energising current (20mA at 240V) it is possible that the current through the snubber network capacitor(s) (when the relay contacts are

open) will be sufficient to continue to energise the contactor.

A solution to the problem is to fit a resistor i parallel with the contactor coil.

Normal contactor operation can be resto fitting an 18K ohm resistor, of at least a rating, across the contactor coil.

Note: Connecting alarm outputs in parallel increases the current which increases the possibility of an external contactor not releasing.

e) **Mains operated solid state relays**

The use of mains operated solid state relays driven from the relay output of the instrument is not recommended.

The current through the instrument's internal snubber network capacitors may allow the input voltage of the SSR to remain above the minimum release voltage. This prevents any control of the power output.

A resistor across the SSR is NOT a solution due to the excessive power dissipation.

W A R N I N G

Removal of the instrument's internal snubber components could give rise to a serious hazard. Gulton Limited and Gulton Industries Inc. do not accept responsibility for any damage which may arise as a result of the unauthorised removal of these components.

SECTION 4 OPERATING INSTRUCTIONS

4.1 INTRODUCTION

Note: The controller can be supplied with U.S.A abbreviations for the various parameters, or with European abbreviations. In this manual the U.S.A abbreviation is followed by / then the European abbreviation.

These instructions assume that the instrument has been set up and locked, to prevent unauthorised tampering with the control parameters. In the locked condition, all functions can be monitored on the digital display, but only the set-point parameter (SP/W1) is adjustable.

In Self-tune or Pre-tune the proportional band, the inte the derivative and the relative gain are always locked, irrespective of the locked/unlocked condition.

If adjustment of functions other than set-point is required it is necessary to unlock the instrument as described in sections 5.1.5 and 5.1.6

For most applications the instrument will be operated with Self-tune operating and in the normal display mode (except when it is necessary to adjust the setpoint value). In the normal display mode, the front panel indicators and display provide sufficient information for the operator to assess whether the process is under satisfactory control.

4.2 FRONT PANEL INDICATORS & PUSHBUTTONS

The instrument provides the following indicators and pushbuttons. (See Figures 4-1 and 4-2)

1	Output 1 indicator (HEAT/Y1)	This indicates when power is applied to the external load connected to output 1. The indicator is non-functional if a linear, VMD or thyristor output is fitted.
2	Output 2 indicator (COOL/Y2)	This indicates when power is applied to the external load connected to output 2. This output is optional.
3	Deviation alarm indicator (ALM1)	Red indicator ON = alarm condition Green indicator ON = safe condition This output is optional.
4	Process alarm indicator (ALM2)	Red indicator ON = alarm condition. This output is optional.

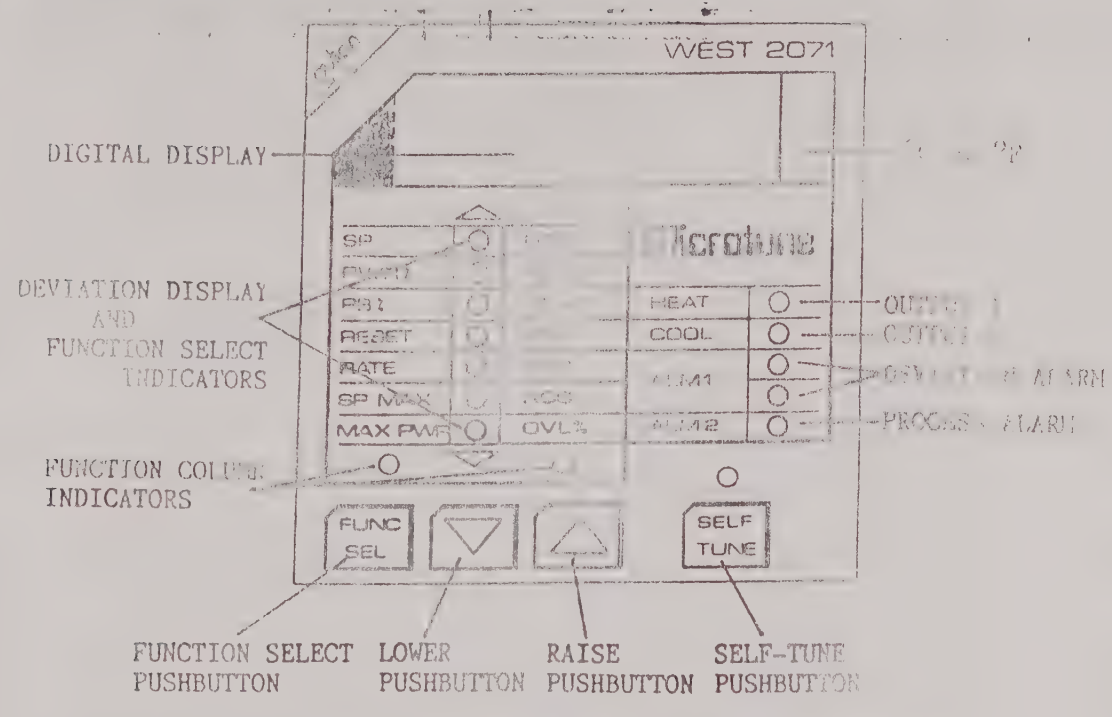


FIGURE 4-1 FRONT PANEL INDICATORS AND PUSHBUTTONS (U.S.A.)

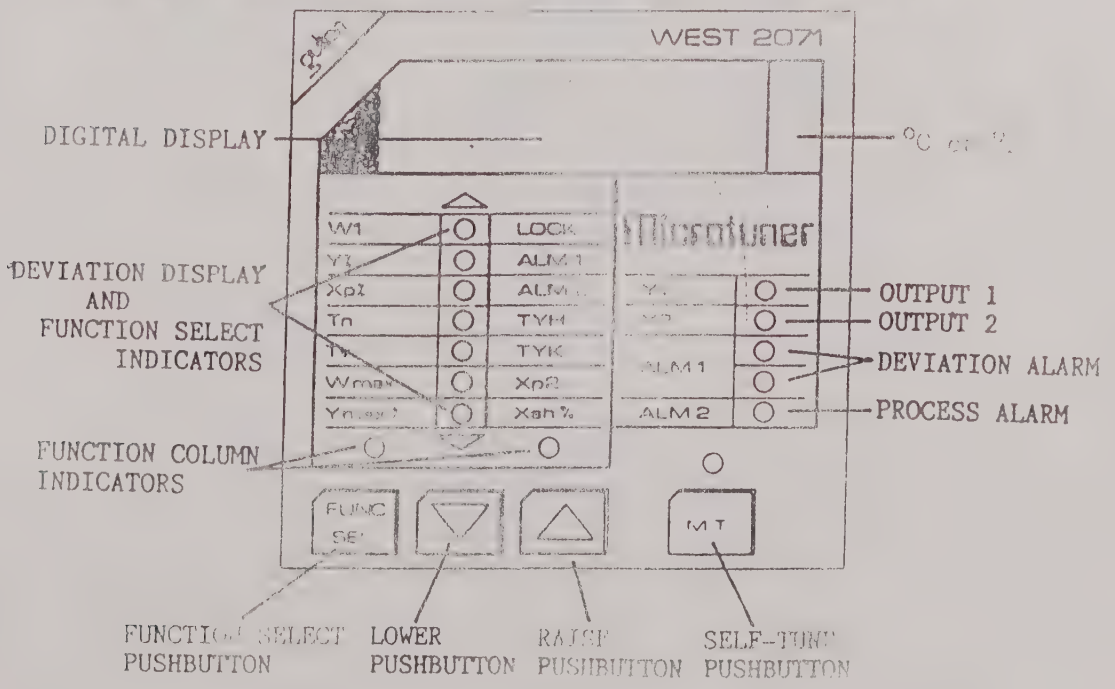


FIGURE 4-2 FRONT PANEL INDICATORS AND PUSHBUTTONS (EUROPE)

5	Raise pushbutton	Used to increase the value of a function e.g. setpoint (SP/W1). If the pushbutton is held down the rate of increase automatically accelerates.
6	Lower pushbutton	Used to decrease the value of a function e.g. setpoint (SP/W1). If the pushbutton is held down the rate of decrease automatically accelerates.
7	Function select pushbutton	Enables the information for a particular function to be presented on the digital display. If the pushbutton is held down the instrument starts stepping through the functions until a return is made to the normal display mode.
8	Deviation indicator display	Bank of seven indicators for separate functions: a) to display deviation from setpoint b) to indicate which function is presented on the digital display (used in association with the two yellow indicators).
9	Function select indicators	These two yellow indicators are used to show which bank of functions is in use. (With both yellow indicators off, the digital display is in the normal mode.)
10	Digital display	This displays the value of the measured variable in the normal mode, or the value of the selected parameter.
11	Self-tune/MT pushbutton	This pushbutton is inoperative in locked mode. See section5.1.5. "LOCK"
12	Self-tune/MT indicator	When the controller is in Self-tune this indicator is illuminated. When the controller is in Pre-tune, it flashes. Self-tune and Pre-tune are described in detail in section 5.

4.3 OPERATING THE INSTRUMENT

A number of paramters can be monitored on the display. On an instrument where the parameters have been locked, the only parameter that can be adjusted from the front panel is the setpoint value (SP/W1); Self-tune and Pre-tune cannot be selected or cancelled.

IF ADJUSTMENT TO ANY OTHER PARAMETER IS REQUIRED WHEN IN THE LOCKED CONDITION SEE SECTION 5.1.6

FOR MONITORING OR ADJUSTING PARAMETERS VIA THE RS422 CHANNEL SEE SECTION 5.4

For most applications the instrument will be operated with Self-tune functioning and in the NORMAL DISPLAY MODE, except when required to adjust setpoint (SP/W1) or monitor output power (PWR%/Y%).

4.3.1 Setpoint

To adjust the setpoint value (SP/W1) the function select pushbutton should be depressed so that the instrument displays the setpoint value (SP/W1 indicator and L.H. yellow indicator are both on). The new setpoint value can now be entered using the raise and lower pushbuttons. If any attempt is made to adjust the setpoint outside the range of the instrument or outside the setpoint limit, the display will flash on and off.

Once the new setpoint value has been entered, the function select pushbutton should again be depressed and remain depressed until the instrument returns to the normal display mode. (The instrument will not step past this position until the pushbutton is released and pressed again. With the instrument locked, the display will automatically revert to the normal display mode, unless output power (PWR%/Y%) is displayed.)

4.3.2 Deviation Display

When the instrument is in the normal display mode, the vertical group of seven rectangular indicators is used to show the deviation from setpoint. The green indicator in the centre shows that the instrument is on control (i.e. measured variable = setpoint + or - deviation switch weighting). A positive deviation (process above setpoint) will cause the green indicator to go off and the red indicator immediately above it to come on. If the deviation increases above the first weighting level the next red indicator will come on. A negative deviation (process

below setpoint) causes the red indicator (below the central green indicator) to come on in the same manner. The deviation weighting values are adjustable by an internal switch. To change the deviation weighting see Section 6.1.3. Fine deviation provides the following weighting:

-2.5%, -1.5%, -0.5%, 0, +0.5%, +1.5%, +2.5%.

Coarse deviation provides the following weighting:

-5%, -3%, -1%, 0, +1%, +3%, +5%.

The two yellow indicators at the bottom of the amber function area on the front panel will be off in this mode.

The instrument is supplied from the factory with the internal switch set to coarse deviation weighting (but this may have been changed during setting up).

4.3.3 Front Panel Functions

The display and adjustment facilities offered from the front panel are detailed below:

NORMAL DISPLAY MODE

Display - process variable
Deviation indicator - deviation from setpoint value (see Section 4.3.2).

SETPOINT VALUE (SP/W1)

The current setpoint value is displayed and can be adjusted using the RAISE and LOWER pushbuttons (see Section 4.3.1).

OUTPUT POWER (PWR%/Y%)

Monitors the percentage power applied to the load over the range 0 to 100% for instruments fitted with output 1 (heat only), and -100% to +100% for instruments fitted with both output 1 and output 2 (heat/cool).

The output power display for different direct acting output types is shown below. The illustration can be extended to other output types and to heat/cool

			REVERSE ACTING OUTPUTS		
PV or MV	OUTPUT POWER DISPLAY	H10 RELAY	H21 LIN. DC CURRENT	H24 LIN. DC CURRENT	H30 THYRISTOR PULSE
ABOVE SETPOINT	100%	ON	20mA	20mA	ON
BELOW SETPOINT	0%	OFF	4mA	0mA	OFF

The following programmable parameters should have been set to suit the user's process, and therefore are available for monitoring purposes only. These settings should not be adjusted without referring to the more detailed procedures outlined in Section 5, Setting up Procedure. Where specific options have not been fitted or enabled, the relevant functions will be skipped.

FRONT PANEL	DESCRIPTION	DISPLAY LIMITS
PB%/Xp%	Proportional band	0 (off) to 100.0%
RESET/Tn	Reset (integral) time	1 second to 99.59 then OFF (blank display)
RATE/Tv	Rate (derivative) time	0 to 99.59
SP MAX/W max	Setpoint limit	Setpoint value to range maximum
MAX PWR/Y max	Output power limit	0% to 100%
LOCK	Lock/code value	0 to 9999
ALM 1	Deviation alarm	Span of the instrument
ALM 2	Process alarm	Range of the instrument
CTH/TYH	Cycle time output 1	2,4,8,16,32,64 (1/4,1/2,1,2,4,8 Thyristor & SSR O/P)
CTC/TYK	Cycle time output 2	2,4,8,16,32,64

RCG/Xp2	Relative gain output 2	0.02 to 1, then blank display
OVL%/Xsh%	Deadband/overlap	+20% to -20% of proportional band

4.3.4 Illegal Operation of the Front Panel

If the instrument is locked, or the displayed function is not alterable from the front panel, as in the case of power output (PWR%/Y%) which can only be used to monitor the power output demands of the process, the display will flash on and off if the RAISE or LOWER pushbuttons are used (except setpoint, see Section 4.3.1). The display will also flash on and off whenever any attempt is made to exceed the range limits of the function being adjusted.

RCG/Xp2	Relative gain output 2	0.02 to 1, then blank display
OVL%/Xsh%	Deadband/overlap	+20% to -20% of proportional band

4.3.4 Illegal Operation of the Front Panel

If the instrument is locked, or the displayed function is not alterable from the front panel, as in the case of power output (PWR%/Y%) which can only be used to monitor the power output demands of the process, the display will flash on and off if the RAISE or LOWER pushbuttons are used (except setpoint, see Section 4.3.1). The display will also flash on and off whenever any attempt is made to exceed the range limits of the function being adjusted.

SECTION 5 SETTING UP PROCEDURES

5.1 CONTROLS AND INDICATORS

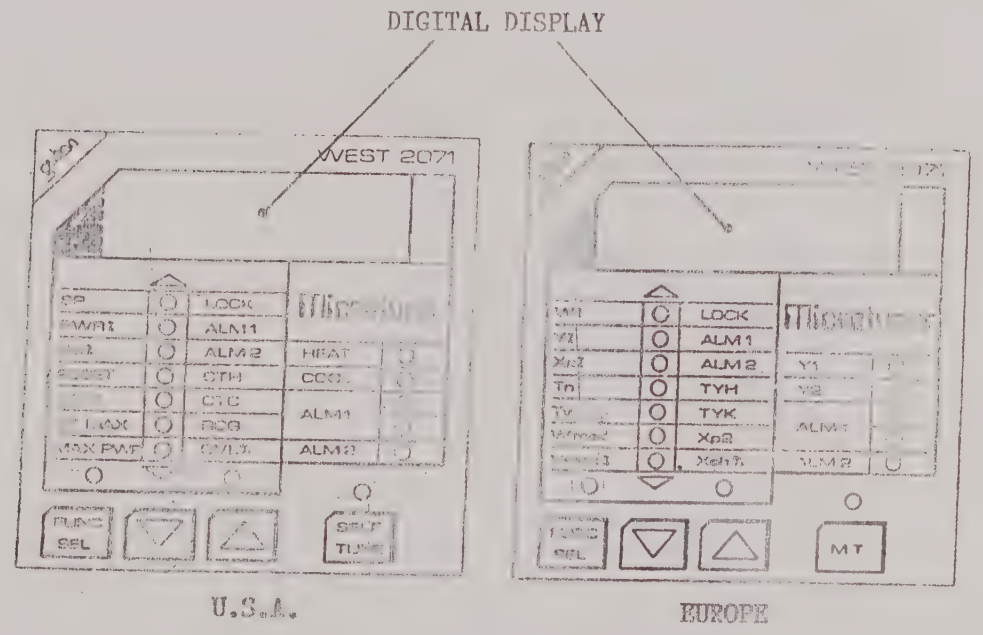


FIGURE 5-1 INSTRUMENT FRONT PANEL

5.1.1 Digital Display

Upper Display — This indicates numerical information relating to the function selected.

5.1.2 Pushbuttons

Function Select — Pressing this pushbutton enables the information for a particular function to be presented on the digital display. If the pushbutton is held down for more than one second, the instrument starts stepping through the functions at a rate of three per second, until a return is made to normal display mode. The instrument will not step past this position until the pushbutton is released and pressed again.

Raise Pushbutton	This is used to raise the value of a selected function, if permissible. If it is depressed momentarily, the value is incremented by one in the least significant digit, or stepped to the next valid value if not continuously variable. If the pushbutton is held down for more than one second the value starts automatically incrementing at a rate of 25 per second. If the pushbutton is still depressed after a further ten seconds, the rate increases to 250 per second. If the value reaches the upper range limit for a selected function, then it stays at that value. Any attempt to step above the limit causes both the digital display and the selected deviation display indicator to flash on and off
Lower Pushbutton	This pushbutton has an identical operation to the Raise pushbutton, except that the value is lowered rather [illegible].
Pre-tune Selection	Provided the instrument is not locked, operating RAISE and LOWER pushbuttons simultaneously puts the controller into the Pre-tune routine. At the end of the routine the instrument reverts to normal mode or Self-tune mode, whichever was previously selected. The Pre-tune routine may be aborted by pushing RAISE and LOWER simultaneously again. See 5.3.1 for details of Pre-tune.
Self-tune Pushbutton	Provided the instrument is not locked, pushing this button changes the mode of the instrument from Normal to Self- or vice versa. The controller is normally delivered set up to operate in Self-tune. See 5.3.2 for details.

5.1.3 Front Panel Indicators

NORMAL DISPLAY MODE

When the instrument is displaying measured variable, the vertical group of seven LED indicators is used to show deviation from setpoint. The green

indicator in the centre shows that the instrument is on control, (i.e. measured variable = setpoint + or - deviation weighting). A positive deviation (process above setpoint) will cause the green indicator to go off and the red indicator immediately above it to come on. If the deviation increases above the first weighting level, the next red indicator will come on.

A negative deviation (process below setpoint) causes the red indicator (below the central green indicator) to come on in the same manner. The deviation weighting values are adjustable by an internal switch (switch 2) located on the main board (see Figure 5-2). To remove the instrument from its case see Section 4.2. When switched to the left, the weightings are for fine deviation:

-2.5%, -1.5%, -0.5%, 0, +0.5%, +1.5%, +2.5%.

When switched to the right, the weightings are for coarse deviation:

-5%, -3%, -1%, 0, +1%, +3%, +5%.

The two yellow indicators at the bottom of the amber function area on the front panel will not be on in this mode.

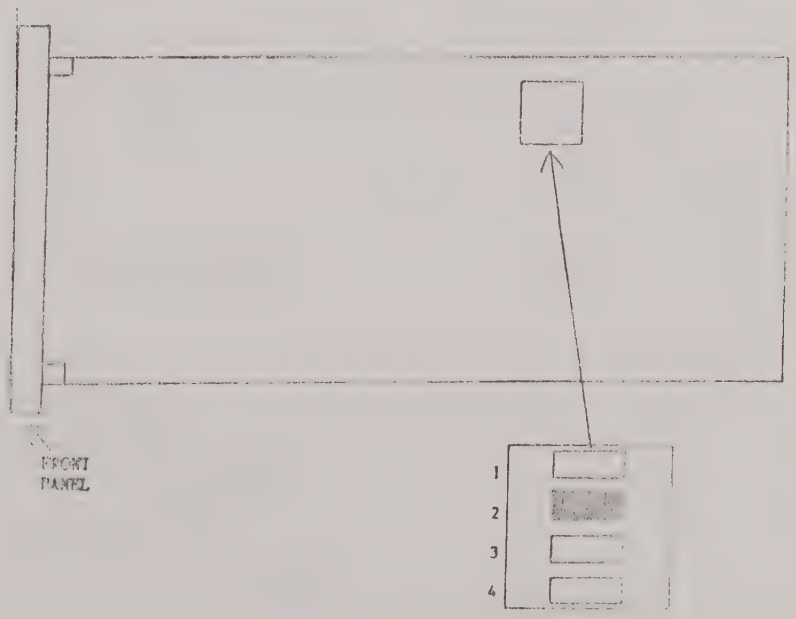


FIGURE 5-2 LOCATION OF DEVIATION WEIGHTING SWITCH ON MAIN (CPU) BOARD.

5.1.4 Function Mode

If the function select pushbutton is pressed while the instrument is in normal display mode, the circular yellow indicator in the lower left corner will light up, indicating that the left hand row of functions will be displayed. The particular function to appear on the digital display is shown by a corresponding rectangular indicator in the centre of the function area.

Having reached the end of the left hand line functions (i.e. MAX PWR/Ymax% the yellow indicator the right hand corner will come on and the rectangular red indicator next to the lock function will light The functions of the right hand side are now accessible.

After the last function on the right hand side has be displayed, the instrument will step to normal display mode.

Output Indicators: the indicators in the blue zone function as follows:

OUTPUT 1 (HEAT/Y1) - this indicates when output 1 relay is energised or the SSR drive is on.

This indicator is non-functional if a linear VMD or thyristor output is fitted.

OUTPUT 2 (COOL/Y2) - this indicates when output 2 relay is energised or the SSR drive is on.

ALM1 - Deviation alarm: red indicator ON = alarm condition
green indicator ON = safe condition

ALM2 - Process alarm: red indicator ON = alarm condition

5.1.5 Functions

Various functions can be displayed and in some instances adjusted from the front panel. The functions and display contents are as follows:

NORMAL DISPLAY MODE

This function is a 'read only' display, and as such may not be altered by the raise or lower pushbuttons.

Display - measured variable
Indicator - indicates deviation from setpoint.

LOCAL SETPOINT

Display - setpoint value (up to setpoint limit)
Indicator - SP/W1

POWER OUTPUT

This function is a 'read only' display, and as such may not be altered by the raise and lower pushbuttons.

Display - output power value (0 to 100% for instruments with output 1 only, -100 to +100 for instruments with output 1 and output 2).
Indicator - PWR%/Y%

PROPORTIONAL BAND - Automatically adjusted by Self-tune

Display - proportional band value (from 0.0% to 10.0% at 0.1% resolution, and from 10.0% to 100.0% at 1% resolution, and 0 for ON/OFF control with preset differential of 0.25%).
Indicator - PB%/Xp%

INTEGRAL TIME - Automatically adjusted by Self-tune

This funtion is skipped if the proportional band is set to zero.

Display - reset (integral) time constant value (1 second to 99 minutes and 59 seconds). If a value greater than 99.59 is selected, the display is blanked and the integral is Off.
Indicator - RESET/Tn.

DERIVATIVE TIME - Automatically adjusted by Self-tune

This function is skipped if the proportional band is set to zero.

Display - rate (derivative) time constant value (0 seconds to 99 minutes and 59 seconds).
Indicator - RATE/Tv

SETPOINT LIMIT MAXIMUM

Display - setpoint limit value (setpoint to range maximum)
Indicator SP MAX/Wmax

OUTPUT 1 (HEAT) POWER LIMIT

This function is skipped if the proportional band is set to zero.

Display - output power limit value (0 to 100%)
Indicator - MAX PWR/Ymax

LOCK

Display - lock value (0 - 9999)
Indicator - LOCK

If the instrument is in the 'locked' condition (switch 1 to 'LOCK', see Figure 5-3) a four-digit security code must be entered before the parameters can be altered from the front panel (except setpoint, which can be alteredin both the 'unlocked' and 'locked' conditions). To unlock the instrument, first select LOCK, using the FUNCT SELECT pushbuttons; next adjust the digital display, using the RAISE and LOWER push-buttons, until it shows the required security code; then select the required function(s).and make any adjustments. To return the controller to the 'locked condition, first select LOCK: next adjust the displ to any number except the security code number; the select another function.

If security code 9999 is selected, then the instrument can only be unlocked by using the internal switch (see Figure 5-3).

DEVIATION ALARM

This function is skipped if the alarm option is not fitted.

Display - alarm deviation (span of instrument)
Indicator - ALM1

PROCESS ALARM

This function is skipped if the alarm option is not fitted.

Display - process alarm
Indicator - ALM2

CYCLE TIME OUTPUT 1

This function is skipped if:
1 the proportional band is set to zero
2 linear output is fitted to output 1
3 VMD output is fitted to output 1

Display - cycle time value (2, 4, 8, 16, 32, 64 seconds)
(1/4, 1/2, 1, 2, 4, 8seconds
if SSR/logic output or
thyristor output)
Indicator - CTH/TYH

CYCLE TIME OUTPUT 2

This function is skipped if:

1 the proportional band is set to zero

2 ON/OFF control of output 2 is selected

3 output 2 is not

Display - cycle time value (2,4,8,16,32,64 seconds)
Indicator - CTC/TYC

RELATIVE GAIN OF OUTPUT 2 - automatically adjusted by Self-tune

This function is skipped if:

1 the proportional band is set to sero

2 output 2 is not fitted.

Display - relative gain value (0.02 to 1.00. If
gain of greater than 1.00 is selected, the
display blanks and output 2 goes to ON/OFF
control using the fixed setting of 0.25%
hysteresis).
Indicator - RCG/Xp2

DEADBAND/OVERLAP

This function is skipped if:

1 the proportional band is set to zero
2 output 2 is not fitted

Display - overlap as a percentage of the proportional
band (-20% to +20%)
Indicator - OVL%/Xsh%

SELF-TUNE

The Self-tune facility in the 2071 Controller utilises software which automatically optimises control parameters for the current application. When a disturbance occurs — a change of load, a change of setpoint or a start-up — specially developed algorithms monitor the responses of the controller and the measured variable, and adjust the proportional band (PB%/Y%), reset (integral) time (RESET/Tn), derivative time (RATE/Tv) and relative gain of output 2 (RCG/Xp2) to improve performance. The new parameters are stored and used as a base for further optimisation after further disturbances.

When the instrument is switched off the adjusted parameters are retained and used when the instrument is switched on again.

On initial switch-on, the controller starts the tuning process from the default parameters (see 5.1.7), unless the Pre-tune facility is used (see 5.3.2) or parameters are set manually.

5.1.6 Lock Code (0 to 9999)

NOTE:This function should be set up first, so that the instrument does not have to be removed from its case while controlling the process.

To set up the lock code, Switch 1 (see Figure 5-3) must be in the OFF position before starting the procedure.

Press the FUNCTION SELECT pushbutton until the LOCK function appears on the display. Select a security code for the lock function using the RAISE and LOWER pushbuttons. Having programmed the LOCK, remove the instrument from its case (see Section 3.2) and set switch 1 (located on the main board next to the fine/coarse deviation switch, see Figure 5-3) to the right. Replace the instrument in its case. All parameters except the setpoint are now locked and any attempt to change a parameter will cause the display to flash and the parameter will remain at the displayed value. When the instrument is in the locked mode and the instrument is left in any function other than 'power output - PWR%/Y%' for a period of ten seconds without any pushbutton being pressed, it will revert to normal display mode. To 'unlock' the front panel the LOCK function must be selected and the security code duplicated on the display using the raise and lower pushbuttons. (See LOCK in section 5.1.5 above)

If a permanent lock on the front panel is required, (except setpoint), select code 9999 before setting the internal switch to the lock position. Then, even if code 9999 is entered on the display, the instrument will remain locked.

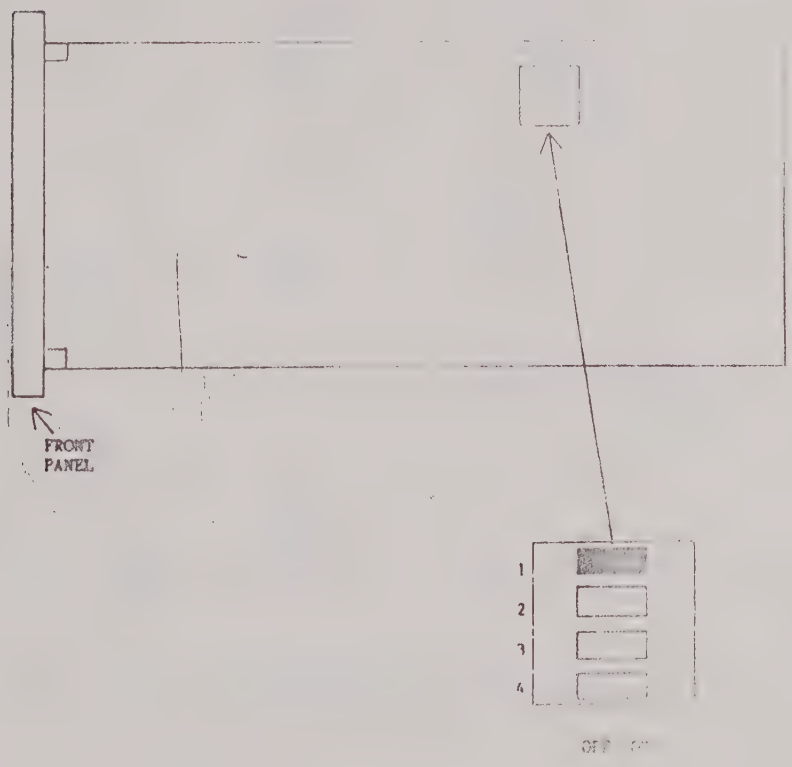


FIGURE 5-3 LOCATION OF LOCK SWITCH ON CPU BOARD

5.2 SETTING UP

5.2.1 Default Values and Settings

When the instrument leaves the factory, it is set to Self-tune, and the programmable parameters have the following default values:

Local setpoint	SP/Wl	range minimum
Proportional band	PB%/Xp%	10.0%
Integral time	RESET/Ti	5 minutes
Derivative time	RATE/Td	1 minute 15 seconds
Setpoint limit	SP MAX/Wmax	range maximum
Output 1 (heat) power limit	MAX PWR/Ymax	100%
Lock	LOCK	lock value 0999 value 0
Deviation alarm*	[illegible]	5 units
Process alarm*	[illegible]	range maximum
Output 1 (heat) cycle time*	C1H/T1H	32 seconds (2 secs thyristor pulse or SSR output fitted)
Output 2 (cool) cycle time*	C2C/T2C	32 seconds
Relative gain of output 2*	RCG/Xp2	1.00
Deadband/overlap*	OVL%/Xsh%	0

*These parameters will only be displayed if the options are fitted.

The parameters will be reset to these default values if certain fault conditions occur (see Section 6, Fault Finding).

5.2.2 Output 1 and 2 Cycle Times

The selection of cycle times depends on the type of process to be controlled. For relay outputs, the cycle time should be as large as possible (consistent with satisfactory control) in order to maximise relay life (cycle times 2, 4, 8, 16, 32, 64 seconds). If the instrument has the thyristor output or SSR option the cycle time can be selected from the range 1/4, 1/2, 1, 2, 4, 8 seconds.

5.2.3 Output 1 (Heat) Power Limit (MAX PWR/Ymax)

This is used to limit the power level on output 1 and may be used to protect the process. It should be setat a value sufficiently high to enable the measured variable to achieve the desired setpoint. If no process protection is required, it may be set at 100%.

5.2.4 Setpoint Limit (SP MAX/Wmax)

This parameter is used to limit the local setpoint and to prevent any damage to the process.

5.2.5. Overlap/Deadband Control

In addition to the automatically controlled parameters, there is a facility for setting up an overlap or deadband (OVL%/Xsh%) for controllers with two outputs. The function of this is shown in Figure 5-4 for a positive value of OVL%/Xsh%. If OVL%/Xsh% is set to a negative value this provides a dead band.

For most applications a value of 0% will be satisfactory.

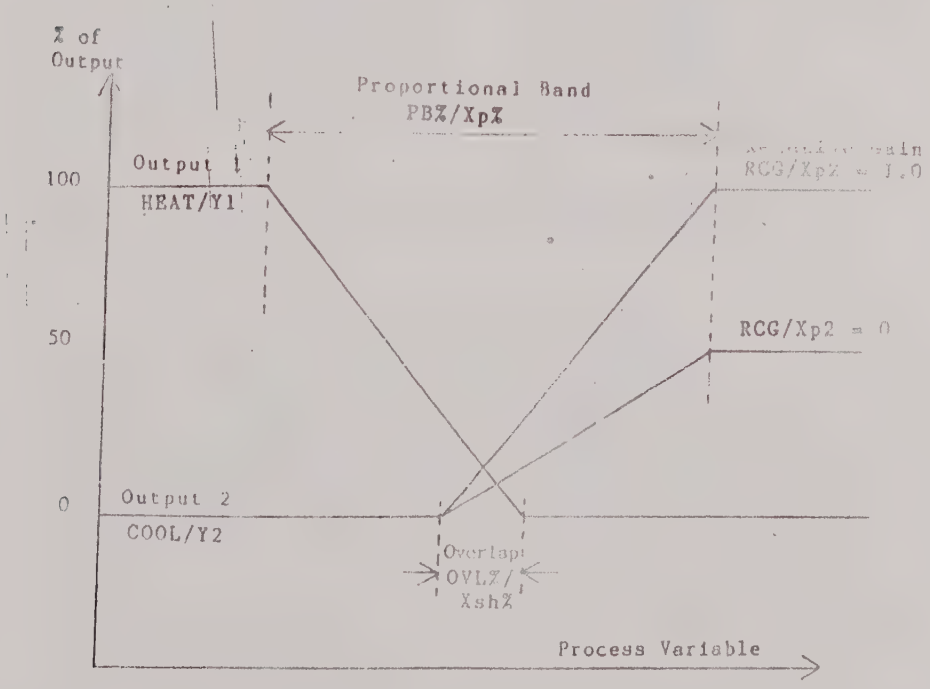


FIGURE 5-4 OVERLAP AND DEADBAND WITH OUTPUTS 1 & 2

5.2.6 Setting up VMD

An adjustable deadband between 0.4% and 5% may be set to ensure that the valve motor is de-energised prior to the valve reaching the desired position (final position being achieved due to the inertia inherent in the system). The control (RV1) is located on the option board (near the terminal contacts). It should be set to its minimum position, fully counterclockwise.

When the process is close to setpoint, the valve will 'hunt'. Turn RV1 control (on the option board) clockwise until the valve stops 'hunting'. For information on removing the instrument from its case, see Section 3.2.

5.3 TUNING THE CONTROLLER

BEFORE STARTING TO TUNE THE INSTRUMENT TO THE PROCESS, ENSURE THAT MAX PWR/Ymax HAS BEEN SET TO THE REQUIRED LEVEL. (See Section 5.2.3).

5.3.1 Using the Pre-tune Function

This function provides a quick way of setting up the controller to approximately the right values of proportional band, integral and derivative. It is intended as a base from which the Self-tune will carry out further optimisation. For the Pre-tune routine to operate the measured variable must be at least 5% of span from the setpoint.

With the instrument in the unlocked mode push RAISE and LOWER pushbuttons simultaneously. The Self-tune indicator will start flashing.

The controller now applies maximum allowed heating (setpoint above measured variable) or maximum cooling (setpoint below measured variable) until the measured variable is halfway between the starting point and the setpoint. The controller then applies maximum reverse power until the measured variable value starts to reverse, i.e. at the peak of the overshoot. On instruments with only one output, "maximum reverse power" means turning off the power output.

The value and duration of the overshoot used as a basis for calculating appropriate values for the control parameters.

At the end of the Pre-tune routine the controller normally reverts to Self-tune operation, provided that it was in Self-tune prior to entering Pre-tune.

5.3.2 Self-tune operation

Self-tune operation is indicated by the front pane LED. In this mode the proportional band, the integral, the derivative and the relative gain are under automatic control and cannot be adjusted by the operator. Self-tune can be enabled or disabled by operating the the Self-tune button in the unlocked mode.

After any manual changes or a Pre-tune routine, once the instrument is put into Self-tune it uses the revised parameters as a basis for optimising the control function. If no manual or Pre-tune changes are made the Self-tune routine uses the default parameters set when the instrument is manufactured.

The Self-tune routine starts when there is any disturbance to the load or the setpoint, and also on start-up. The response of the instrument and the measured variable are used by algorithms in the software to adjust the proportional band (PB%/Xp%), the integral (RESET/Tn), the derivative (RATE/Tv) and the relative gain of output 2 (RCG/Xp2). The adjusted parameters are stored and used as a basis for any further adjustments which the process requires.

5.4 ALARMS
(See Appendix 2 for product code information)

5.4.1 Alarm 1 (ALM1)

This alarm is a deviation alarm which may be:

a) High deviation direct or reverse acting

b) Low deviation direct or reverse acting

c) Limit comparator direct or reverse acting (band alarm).

The deviation value can be set by using the ALM1 function on the front panel.

The red indicator will be ON when:

a) the measured variable is greater than setpoint plus the deviation value

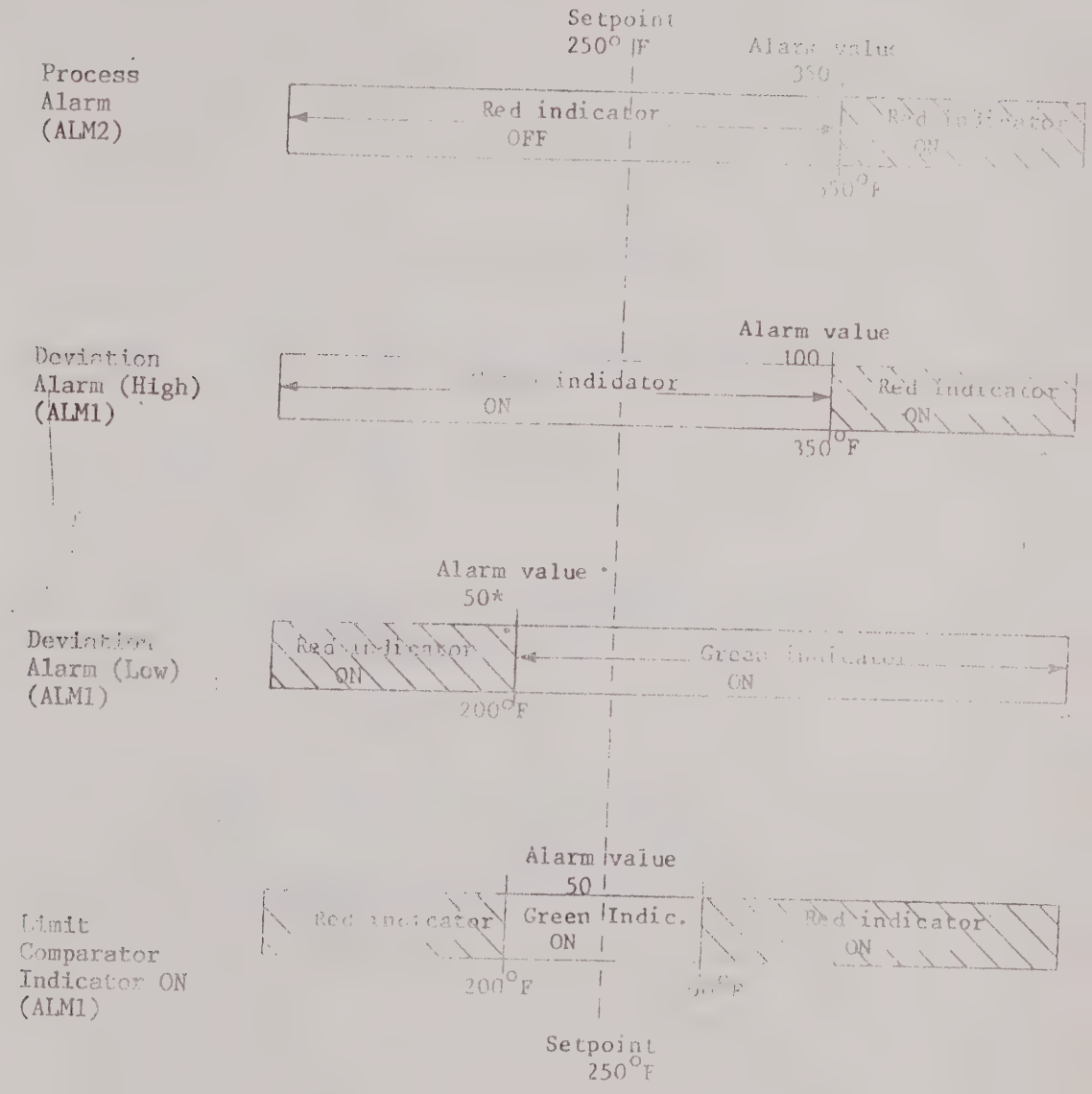
b) the measured variable is less than setpoint minus the deviation value

c) the value goes outside the deviation band.

5.4.2 Alarm 2 (ALM2)

This alarm is a process alarm. A red indicator will be ON if the measured variable rises above the preset value. The preset value can be set by using the ALM2 function on the front panel.

AFTER SETTING UP THE INSTRUMENT, SET THE LOCK TO PREVENT UNAUTHORISED TAMPERING WITH THE FUNCTIONS (See Section 5.1.6).



* The alarm value is always positive, but the deviation is pos

FIGURE 5-5 SETTING UP ALARMS (example)

5.5 RS422 OPERATION

5.5.1 General

An RS422 Serial Communications facility can be included as an option at time of purchase. Data characters transmitted consist of one start bit, seven data bits, one parity bit (even) and a stop bit. The link is asynchronous and operates at 4800 Baud.

For users who find it inconvenient to interface to RS422 at 4800 Baud, West manufactures a Serial Communications Interface Adapter (SCIA 16) which can be used to interface RS422 at various other standard Baud rates to a West controller, or to interface RS232 at one of a range of standard Baud rates to a West controller.

The West controller always operates as a slave and can be set to respond to one of eight address commands, enabling up to eight controllers to be connected to one master device port.

The serial communications facility enables remote interrogation and adjustment of all parameters, except where adjustment is restricted by locking of the instrument, or by operating with Self-tune or Pre-tune.

5.5.2 RS422 Communications Protocol

All communications are initiated by the master device (usually a computer). The master sends commands or queries, and the controller replies with an acknowledgement of the command or the answer to the queries. All messages, in either direction, consist of a start character, an address character, a parameter/data string and a terminate character.

Messages from the master are of four types:

1 L 'N' ? ? *

2 L 'N' 'P' 'C' *

3 L 'N' 'P' # 'D...

4 L 'N' 'P' I *

where all characters are Ascii and

L is the start of message character (Hex 4C)
'N' is the controller address, 1 - 8 (Hex 31 - 38)
'P' is the parameter to be interrogated or modified (See Table 5-1)(Hex 41 - 5A)
'C' is the command

# indicates 'DATA' is to follow (Hex 23)
'DATA' is numeric data in Ascii (See Table 5-2)
* is the end of message character (Hex 2A)

All messages are 5 or 10 characters long and include no spaces.

Type 1 Message

L 'N' ? ? *

This is used by the master to determine whether a controller is active. The reply from the controller addressed is:

L 'N' ? A *

A controller which is not active will give no reply.

Type 2 Message

L 'N' 'P' 'C' *

This type is used to interrogate, raise or lower a selected parameter. 'P' is the parameter as defined in table 5-1, and 'C' is the command which is:

+ to increment the value of the parameter
- to decrement the value of the parameter
? to enquire the value of the parameter

The reply from the controller is of the form

L 'N' 'P' 'DATA' A *

where 'DATA' is five Ascii coded digits whose meaning is shown in table 5-2. The data is the value asked for in the enquiry or the new value after modification.

If the value specified is not valid, because it is not modifiable or outside the allowed limits, the controller replies with

L 'N' 'P' 'DATA' N *

The DATA part of the message has no significance, and is used only to keep the length of the message constant.

If the Measured Variable or the Deviation is interrogated when the Measured Variable is outside the range of the instrument, the reply is

L 'N' 'P' < ? ? > 0 A * for over-range
L 'N' 'P' < ? ? > 5 A * for under-range

Type 3 Message

L 'N' 'P' # 'DATA' *

This type is used by the master to set a parameter the value specified in DATA. The command is not implemented by the controller immediately, but awaits a type 4 command.

On receipt of a type 3 message, if the DATA and the parameter specified are valid, the controller echoes back

L 'N' 'P' 'DATA' I

indicating that the controller is ready to implement the command. If the parameter is not a letter, or if any of the DATA characters are not numeric, the message is ignored.

If the parameter specified is invalid or may not be modified, or if the value specified is outside the allowed limits, the controller replies with a negative acknowledgement

L 'N' 'P' 'DATA' N *

Type 4 Message

L 'N' 'P' I *

This is sent by the master following a successful type 3 message and reply. Provided that the DATA and parameter specified in the previous type 3 message are still valid, the controller sets the parameter to the value specified and replies

L 'N' 'P' 'DATA' A * where DATA is new value.

If the value and parameter specified are not valid, the controller replies with the negative acknowledgement

L 'N' 'P' 'DATA' N *

If the previous message received by the controller was not a valid type 3 message, the type 4 message is ignored.

A leaflet giving further details of software requirements and suggestions for programs to be implemented on the master, is available on request from West Division of Gulton.

Parameter Letter	Parameter	Abbreviation	Modifiable?
A	Setpoint Maximum	SP MAX/Wmax	Yes
B	Power Limit	MAX PWR/Ymax%	Yes
C	Alarm 1 Value	ALM1	Yes
D	Derivative Time	RATE/Tv	No #
E	Alarm 2 Value	ALM2	Yes
F	N/A		
G	Range Maximum	—	No
H	Range Minimum	—	No
I	Integral Time *	RESET/Tn	No #
J	N/A		
K	Overlap/Deadband	OVL%/Xsh%	Yes
L	Status **	—	No
M	Measured Variable	—	No
N	Cycle Time Heat	CTH/TYH	Yes
O	Cycle Time Cool	CTC/TYK	Yes
P	Proportional Band	PB%/Xp%	No #
Q	N/A		
R	N/A		
S	Setpoint	SP/W1	
T	N/A		
U	Relative cooling Gain ***	RCG/Xp2	No #
V	Deviation (MV/PV - SP)	—	No
W	Power Output Level	PWR%/Y%	
X	N/A		
Y	N/A		
Z	N/A		

TABLE 5-1. PARAMETER LETTERS FOR THE 2071 WITH RS422 LINK

These parameters can be adjusted from the RS422 channel only when the controller is in not Self-tune or Pre-tune

* To set the integral OFF using the parameter set command, the DATA field should be set to 00002 (but see # above).

** The value of the status indicates the state of the two alarms. If the value of the status is considered as a binary number, bit 0 (the least significant bit) of the status byte refers to alarm 1, while bit 1 refers to alarm 2. If a bit is 1 the relevant alarm is in the safe condition; if a bit is 0 the alarm is in the unsafe condition, or not fitted or switched off.

*** To select ON/OFF cooling with linear or time proportioned heating, the DATA field for the Relative Cooling Gain should be set to 00002 (but see # above).

'DATA' FORMAT

The 'DATA' field contains five Ascii decimal digits. The first four form a decimal number whose sign and magnitude are defined by the fifth digit as shown in the table.

First four digits	Fifth digit
+abcd	0
+abc.d	1
+ab.cd	
+a.bcd	
N/A	
-abcd	
-abc.d	
-ab.cd	7
-a.bcd	8
N/A	9

TABLE 5-2 'DATA' FIELD FORMAT

5.5.3 RS422 Control Switch

The CPU board is equipped with 4 switches as shown in Figure 5-9. With switch 3 OFF, the instrument will repond to query type messages, giving the requested parameter and status values, but will not implement any parameter changes commanded switch 3 ON, parameter changes can be effected over the RS422 channel.

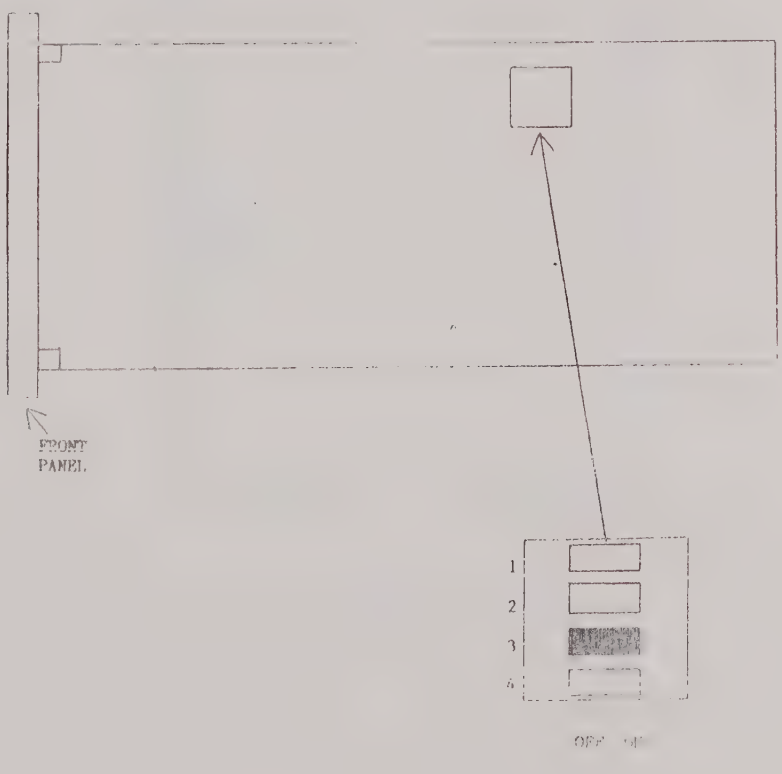


FIGURE 5-9 RS422 CHANNEL CONTROL SWITCH

5.5.4 RS422 Channel Selection Switch.

The address of the RS422 channel is selected by a small rotary switch, which can be adjusted by means of a screwdriver. Only positions 1 to 8 should be used, not 0 and 9.

To get acces to the channel selector switch the instrument must first be removed from its housing (see 3.2 d). The position of the switch is shown in Figure 5-10.

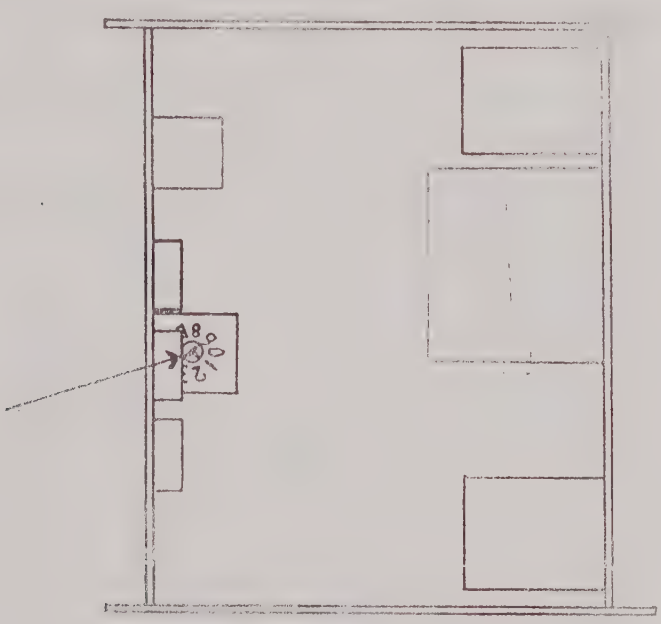


FIGURE 5-10 RS422 CHANNEL SELECTOR SWITCH
Viewed from the rear of the instrument after removal from housing.

SECTION 6 FAULT FINDING

The following instructions are provided to assist in operational fault identification:

1) Display blank when power applied

   a) Check the mains wiring (see Sections 3.3 and 3.4)
   b) Check fuses.

2) Display reads < >

   a) Check the input wiring
   b) Is the input outside the range of the instrument?

3) All display decimal points on (e.g. .1.0.0. instead of 100) indicates that a parameter has been corrupted.

   a) This can occur when power is first applied during setting up. If this is the case, set up the instrument Section 5). After adjustment the decimal points disappear.
   b) If this has occurred during operation, a parameter been corrupted. To clear the decimal points, selec setpoint SP/W1 and use the raise or lower pushbutt Check all other parameters and reset if necessary.

4) Display flashes 8.8.8.8.

   a) Internal component failure, consult WEST

5) Output not switching

   a) Check that power limit has been set (MAX PWR/Ymax)

6) Process undershoots

   a) Check that the power limit (MAX PWR/Ymax) has been set to provide sufficient power to the load.
   b) Check that the instrument has been tuned to the load (see Section 5.2).

7) The display flashes on and off when the raise or lower pushbuttons are pressed.

   a) An illegal operation is being attempted:

      1) A change of a parameter that is locked is being attempted.
      2) A change of a parameter that is not alterable from the front panel (e.g. PWR%/Y%) is being attempted.
      3) A change of a parameter beyond its range limits is being attempted.

8) RS422 Communications Link Failure

1) Check the wiring links to the master device. In particular check the common line connection. This must be used to ensure that the difference between the 0V at the transmitter and the receiver does not exceed a few volts Section 3.9 gives details of RS422 wiring requirements.
2) Check the Baud rate (should be 4800 Baud), parity (should be even) and number of data bits (should be 7).
3) Check that the correct terminating character is being sent to the controller. The last character of a message should be * , not <CR>.
4) Check RS422 control switch (see section 5.5.3)
5) Check RS422 channel selection (see 5.5.4)

SECTION 7 RE-RANGING & RECONFIGURING THE INSTRUMENT

7.1 TOOLS REQUIRED

1) Crosshead or Posidriv screwdriver

2) Small smooth jaw pliers

3) Small flat-bladed screwdriver

7.2 DISMANTLING THE CONTROLLER

7.2.1 Withdraw the Controller from its Housing

1) Insert a small screwdriver to the slot at the lower right hand corner of the front panel, gently lever up the catch and pull out the lever until it is at 90°. See Fig. 7-1.

2) Grasp the front panel of the controller and withdraw it from its housing.

This procedure leaves the connections made to the rear panel intact, and these need not be touched.

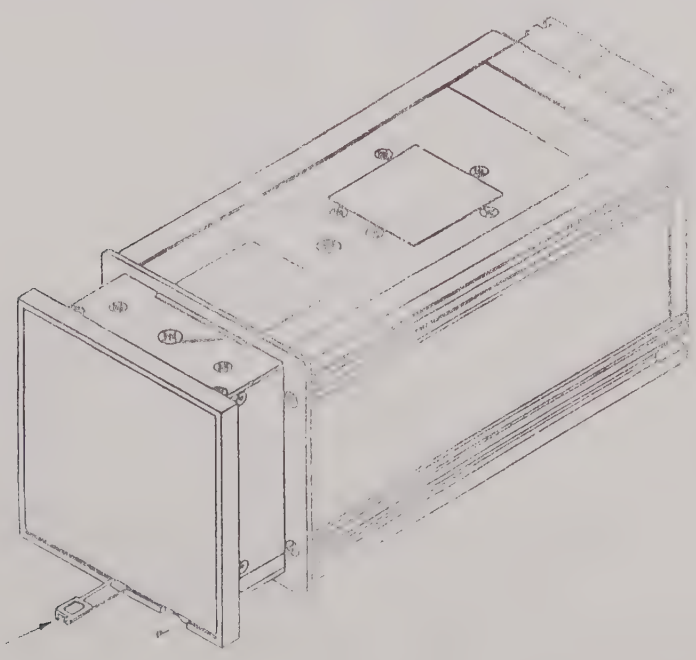


FIGURE 7-1 WITHDRAWING THE CONTROLLER FROM ITS CASE

EXPLODED VIEW OF CONTROLLER

7.2.2 Remove Front Panel

1) Remove the four screws holding the front bezel assembly. (two on the top plate and two on the bottom plate, marked "A" on Figures 7-3 and 7-4)

2) Unplug the front panel from the rest of the instrument.

3) The front panel label is now accessible from the back of the front bezel asembly. (This label may be replaced with a custom-made label or may require changing when the instrument is re-ranged from ^{o}C to ^{o}F.)

7.2.3 Remove Bottom Plate (See Figure 7-3)

1) The two screws "A" at the front of the plate should be already been extracted when removing the front panel.

2) Extract the four screws "B" holding the bottom plate to the CPU and I/O boards.

3) Extract screw "C", if an option board is fitted.

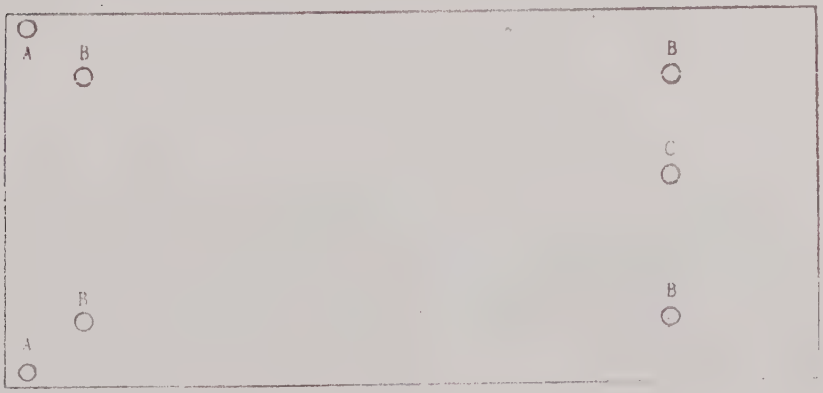


FIGURE 7-3 BOTTOM PLATE

.2.5 Remove the CPU Board

1) The CPU board is the right hand board when looking at the front of the controller.

2) Extract the two screws marked "D" on the diagram of the top plate (Figure 7-4).

3) Pull the board away from the assembly, unplugging the ribbon connector from its socket and the plug connecting to the display board. TAKE CARE THAT THE BOARD IS NOT PLACED ON ANYTHING WHICH MIGHT SHORT CIRCUIT THE BATTERY

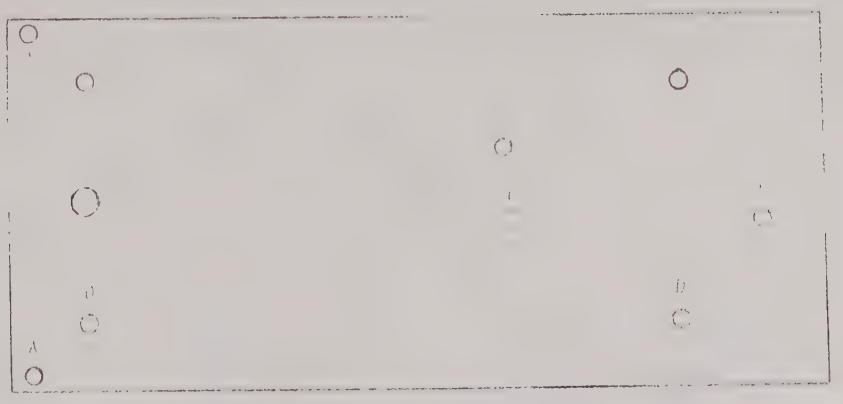


FIGURE 7-4 TOP PLATE

7.2.6 Remove the Option Board (if fitted)

1) Extract screws on the top plate marked "E" on Figure 7-4. DO NOT EXTRACT ANY OTHER SCREWS

2) Unplug the ribbon connector from its socket.

7.3 LINK JUMPERS

Re-ranging and reconfiguring the instrument is by the use of link jumpers on the PCBs. Reconfiguration to another variant is possible only if the relevant hardware is fitted. (Appendix 3 lists Input/Output PCBs and Option PCBs available, together with their product codes).
Details are given in this section on all the movable link jumpers on each board.

The information is divided into the following headings:

1) Inputs

2) Outputs

3 Alarms

4) Thermocouple break prot

5) Mains/line voltage

6) CPU Link jumpers

7) Internal (CPU) switches

7.4 INPUTS

There are four categories of inputs :

1) Thermocouple range and type
2) RTD range
3) Linear voltage range
4) Linear current range

NOTE: Range changing is confined to range changing within one category, i.e. between thermocouples, unless a different Input/Output board is fitted. (Appendix 3 lists I/O PCBs and product codes). Link jumpers on both the CPU board and the Input Output Board need to be changed. Figure 7-2 shows the positions of the boards.

7.4.1. Range Changing Procedure

1) Carry out the dismantling procedure described in Section 7.2.

2) All the link jumper positions required for changing the range are now accessible using pliers.

The link jumper positions for the CPU board are shown in Figure 7-5. (Figure 7-5 shows the component side of the board). The Input/Output board depends upon the Input/Output combination for the particular instrument. The following table indicates which illustration shows the correct Input/Output board for a given Input/Output combination.

INPUT	OUTPUT	SEE FIGURE
Thermocouple,Linear	Relay,SSR,VMD or Thyristor	7-6
Thermocouple,Linear	Linear	7-7
RTD	Relay,SSR,VMD or Thyristor	7-8
RTD	Linear	7-9

NOTE: SOME OF THESE BOARDS ARE SUPPLIED IN ALTERNATIVE LAYOUTS, AND THESE ARE SHOWN IN THE DIAGRAMS.

TABLE 7-1 TABLE OF ILLUSTRATIONS FOR INPUT/OUTPUT COMBINATIONS

3) Refer to the label on the top plate of the instrument to determine the input product code. (The one beginning with T).

4) Look up the input code and link jumpers in the tables and using the appropriate figures from 7-6 to 7-9 remove the relevant link jumpers

5) Determine the product code for the new range required (See Appendix 2) and refit the link jumpers in the appropriate position using the tables and figures.

6) Update the instrument product code label located on the top plate of the instrument

7.5 OUTPUTS

7.5.1 Relay Outputs

Reverse or direct action is selected by LJ7 on the CPU board. (See Figure 7-5 and Table 7-5).

7.5.2 Linear Outputs

A linear output instrument can be reconfigured from or to any of the following outputs :

1) D.C.current 4-20mA
2) D.C.current 0-20mA
3) D.C. voltage 1-5V
4) D.C. voltage 0-5V

Link jumpers on the Input/Output board are used. Figure 7-2 shows the position of the board. Link jumpers on the CPU board may need to be changed, refer to Table 7-5.

NOTE: IT IS NOT POSSIBLE TO CHANGE THE OUTPUT TYPE BY CHANGING THE LINK JUMPERS, EXAMPLE : LINEAR TO VMD. This requires a different PCB (See Appendix 3 for available I/O and Option boards)

Procedure

1) Carry out the dismantling procedure described in Section 7.2.

2) All the link jumper positions required for changing the output are now accessible using pliers.

3) For a thermocouple or linear input instrument see Figure 7-7 for the positions of the link jumpers on the Input/Output board. For a RTD input instrument see Figure 7-9 for the positions of the link jumpers on Input/Output board.

4) Reconfigure the link jumpers LJ26 to LJ31 on the Input/Output board for the output required from Table 7-5.

5) Update the product code on the label on the top plate.

7.6 ALARMS

Reconfiguration of the alarms is only possible if the necessary hardware has been fitted to the instrument.

Link jumpers on the Option Board (standard instruments) VMD board (VMD instruments) or Thyristor Output board (Thyristor Output instruments) are used to reconfigure the alarms.

NOTE: ALARM OPTIONS PROVIDED WITH VMD OUTPUT INSTRUMENTS DIFFER FROM THOSE PROVIDED WITH OTHER INSTRUMENTS.

7.6.1 Procedure

1) Carry out the dismantling procedure described in Section 7.2.

2) Find from Appendix 2 the product code for the alarm options required. (C---?)

3) Compare the new product code against the appropriate option board variant chart (Table 7-5) and install the appropriate link jumpers. The positions are shown in the relevant Figure 7-10, 7-11 or 7-12.

4) If the Option board is being changed it may necessary to change LJ 1, 3 and 6 on th

5) Update the product code label located on t plate of the instrument.

7.7 THERMOCOUPLE BREAK PROTECTION

For thermocouple input instruments it is possible to select the type of operation under open circuit thermocouple by altering a link jumper on the Input/Output Board

The types of thermocouple break protection are as :
a) Upscale (standard)
b) Downscale
c) No break protection

The link jumper positions for the appropriate Input/Output Board are shown in either Figure 7-6 or Figure 7-7.

7.7.1 Procedure

1) Carry out the dismantling procedure described in Section 7.2.

2) Find from Section 2 the product code for the new options required. (Code T-----?)

3) The required link jumpers are given in Table 7-2, and these should be inserted as shown in Figures 7-6 and 7-7.

4) Update the product code label located on the top plate of the instrument.

7.8 MAINS (LINE) VOLTAGE

Selection for either 240V or 110V a.c. operation is possible by moving a link jumper on the Input/Output board.

8.1 Mains (Line) Voltage Change Procedure

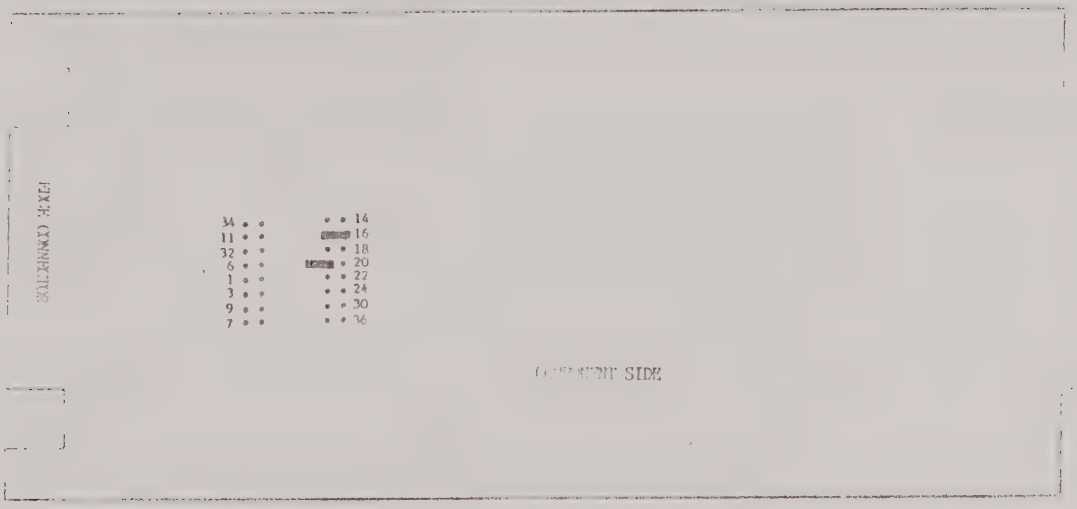
1) Dismantle the controller as described in Section 7.2.

2) Change the link jumpers to positions shown in Table 7-5 and Figures 7-6 to 7-9.

3) Amend the product code on the top plate of the instrument as appropriate.

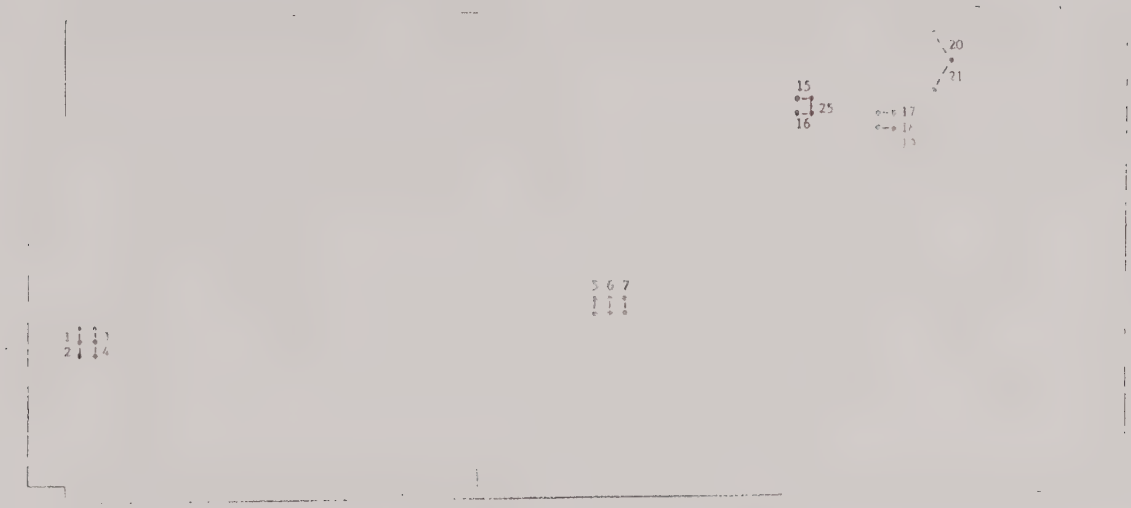
7.9 CPU LINK JUMPERS

LINK JUMPERS MAY NEED TO BE CHANGED ON THE CPU BOARD FOR THE FOLLOWING :
1) Input range changing (see 7.4 INPUTS).
2) Linear output change (see 7.5 OUTPUTS).
3) Change of I/O board (See Appendix 3) LJs 7, 9, 11
4) Change of Option board (See Appendix 3) LJs 1, 3, 6



NOTE: Link jumpers which are not required for any specific instrument configuration should be fitted in the parked position.
Link jumper 16 is shown in the active position.
Link jumper 20 is shown in the parked position.

FIGURE 7-5 CPU BOARD LINK JUMPERS



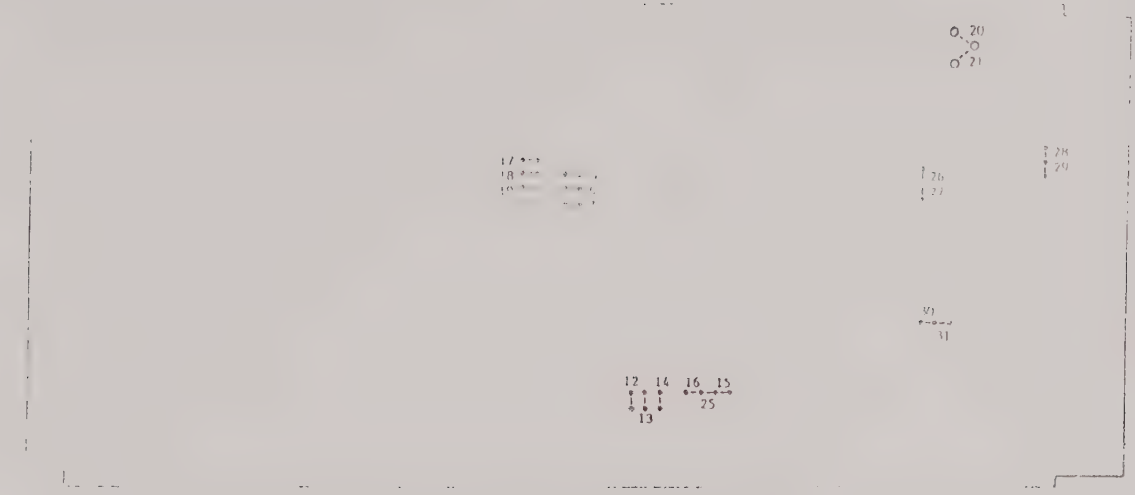
Layout A

Board 739/407

Layout B

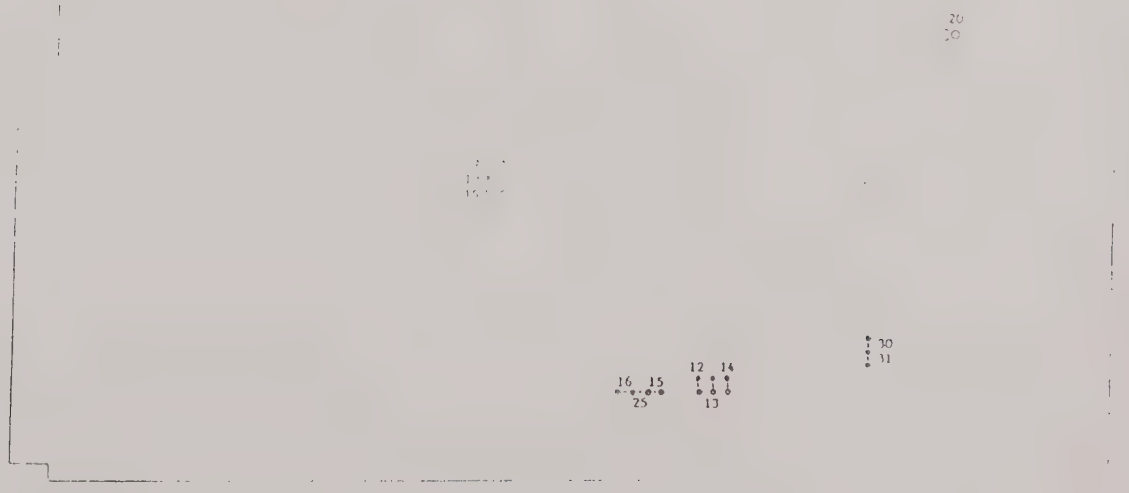
Board 739/407

FIGURE 7-6 THERMOCOUPLE, LINEAR INPUT/ RELAY,SSR, VMD OR THYRISTOR OUTPUT PCB - LINK JUMPER POSITIONS



Layout A

Board 739/416



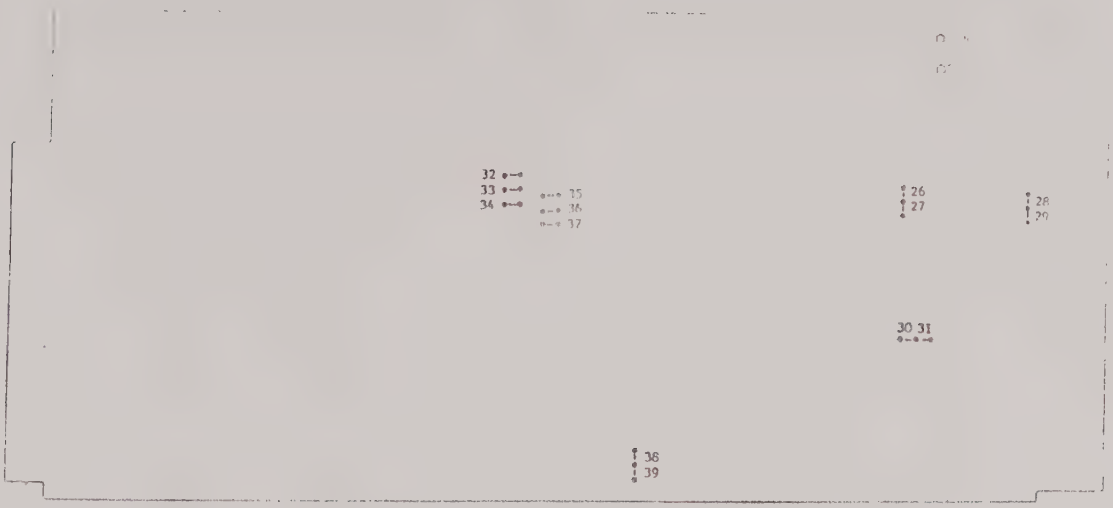
Layout B

Board 739/416

FIGURE 7-7 THERMOCOUPLE, LINEAR INPUT/LINEAR OUTPUT PCB - LINK JUMPER POSITIONS

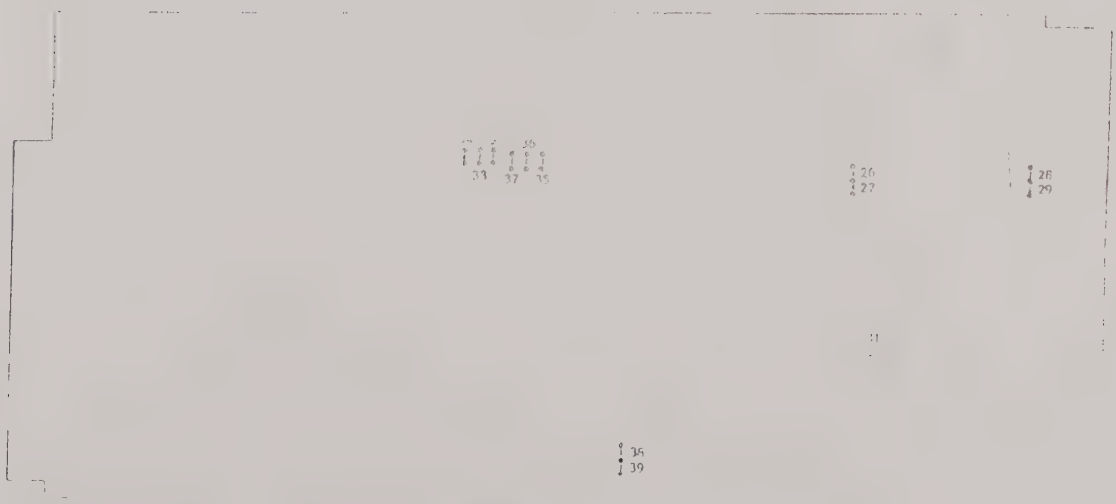
Board 739/420

FIGURE 7-[illegible] KTD INPUT/[illegible] [illegible] OR THYRISTOR OUTPUT [illegible]
– LINK JUMPER POSITI[illegible]



Layout A

Board 739/419



Layout B

Board 739/419

FIGURE 7-9 RTD INPUT/LINEAR OUTPUT LINK JUMPER POSITIONS

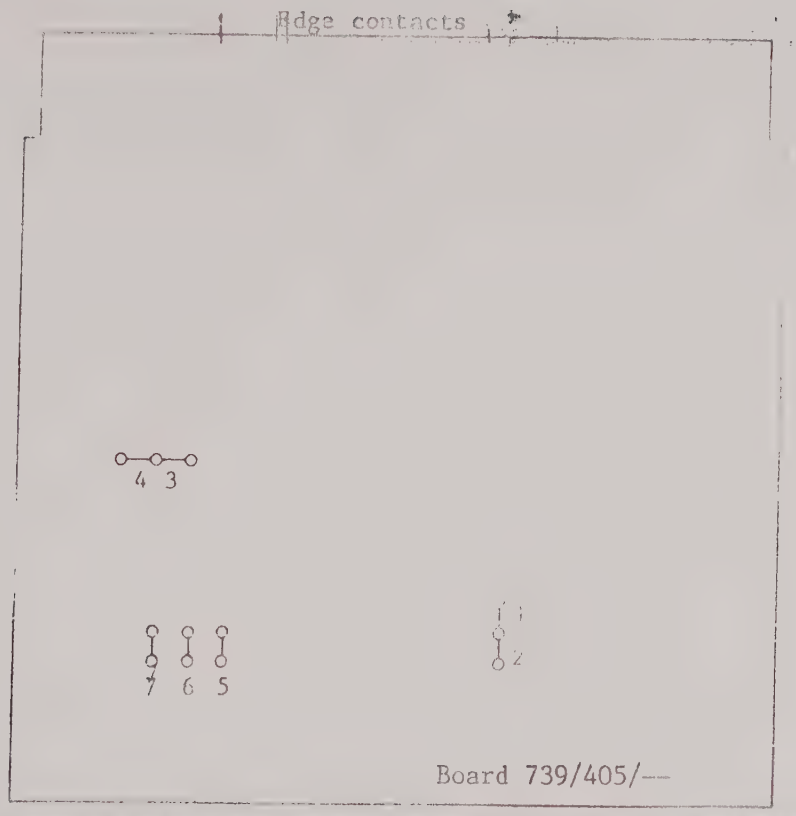


FIGURE 7-10 OPTION BOARD LINK JUMPER POSITIONS (ALARMS) -- STANDARD INSTRUMENTS

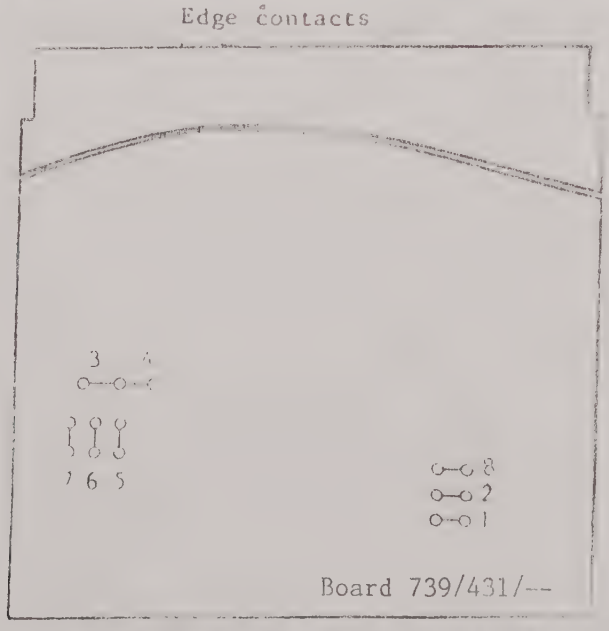


FIGURE 7-11 OPTION BOARD LINK JUMPER POSITIONS (ALARMS) -- [illegible] INSTRUMENTS

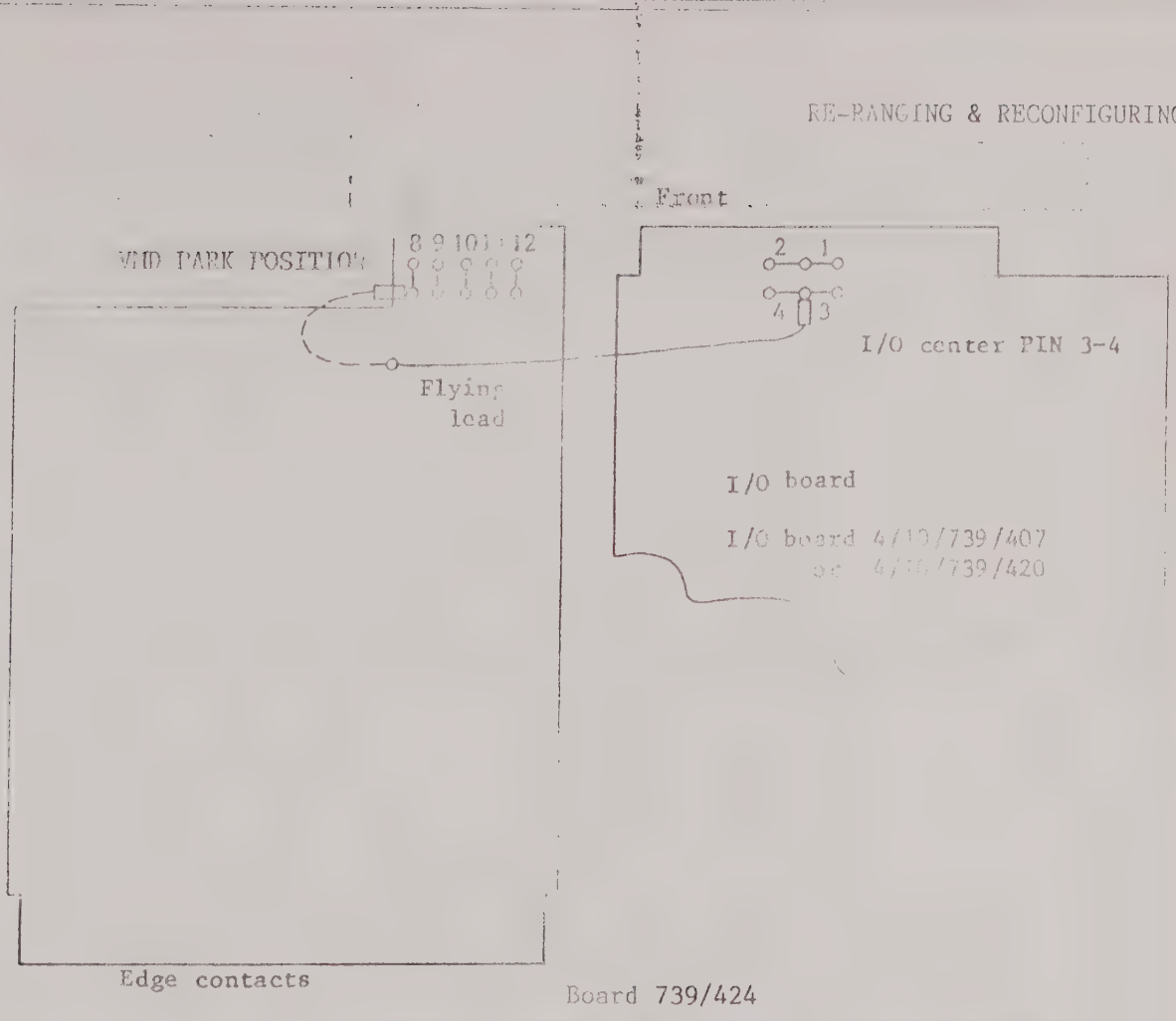


FIGURE 7-12 OPTION BOARD LINK POSITIONS (ALARMS) - VMD OUTPUT INSTRUMENTS

INPUT PROD.CODE	TYPE	RANGE SCALE	CPU LINK JUMPERS 14	16	18	22	24	INPUT/OUTPUT PCB [illegible] JUMPERS 5	6	7	[illegible]	17	18	19
T1127	R	0-1650°C		X	X				X					X
T1128		32-3002°F		X	X		X		X					X
T1227	S	0-1650°C				X			X					X
T1228		32-3002°F				X	X		X					X
T1415	J	0.0-205.0°C		X							X	X		
T1416		32.0-401.0°F		X			X				X	X		
T1417		0-450°C	X						X		X			X
T1418		32-842°F	X				X		X		X			X
T1419		0-760°C	X	X				X			X		X	
T1420		32-1400°F	X	X			X	X			X		X	
T1815	J(DIN)	0.0-205.0°C		X			X		X			X		
T1816		32-401.0°F		X			X		X			X		
T1817		0-450°C	X				X		X					X
T1818		32-842°F	X				X		X					X
T1819		0-760°C	X	X			X	X						
T1820		32-1400°F	X	X			X	X						
T1715	K	-200 to [illegible]°C	X											X
T1716		-328 to [illegible]°F	X			X	X							X
T1721		0.0-205°C			X				X		X			
T1722		32.0-401.0°F			X		X		X		X	X		
T1723		0-600°C	X		X				X		X	X		
T1724		32-1112°F	X		X		X		X		X			X
		0-1371°C	X	X	X				X		X			X
		32-2500°F	X	X	X		X		X		X			

THERMOCOUPLE BREAK PROTECTION		INPUT/OUTPUT [illegible] 15	[illegible]
T1——	UPSCALE (STANDARD)		X
T1——21	DOWNSCALE	X	
T1——22	NO BREAK PROTECTION		

TABLE 7-2 THERMOCOUPLE INPUT - [illegible] JUMPERS

INPUT			CPU LINK JUMPERS						INPUT/OUTPUT PCB LINK JUMPERS							
PROD.CODE	TYPE	RANGE	14	16	18	20	22	24	32	33	34	35	36	37	38	39
T2221	RTD	0 to +600°C		X		X		X		X		X				X
T2222	RTD	32 to 1112°F		X		X	X	X		X		X				X
T2230	RTD	-101.0 to +100.0°C		X		X					X			X	X	
T2231	RTD	-150.0 to +212.0°F		X		X	X				X			X	X	
T2232	RTD	-200.0 to +205.0°C	X	X		X				X			X		X	
T2233	RTD	-328.0 to +401.0°F	X	X		X	X			X			X		X	

PROD.CODE	TYPE	RANGE	SCALE	5	7	12	13	14	17	18	19
T3113	LIN	0-20mA	0-10.00								W
T3114	LIN	4-20mA	0-10.00								W
T3213	LIN	0-20mA	0-14.00								W
T3214	LIN	4-20mA	0-14.00								W
T3313	LIN	0-20mA	[illegible]								W
T3314	LIN	4-20mA	[illegible]								W
T3413	LIN	0-20mA	0-100.0								W
T3414	LIN	4-20mA	0-100.0		X						W
T3513	LIN	0-20mA	0-300.0		X						W
T3514	LIN	4-20mA	0-300.0		X						W
T3613	LIN	0-20mA	0-700.0		X						W
T3614	LIN	4-20mA	0-700.0		X						W
T3713	LIN	0-20mA	0-1000		X						W
T3714	LIN	4-20mA	0-1000		X						W
T3813	LIN	0-20mA	0-3000		X						W
T3814	LIN	4-20mA	0-3000		X						W

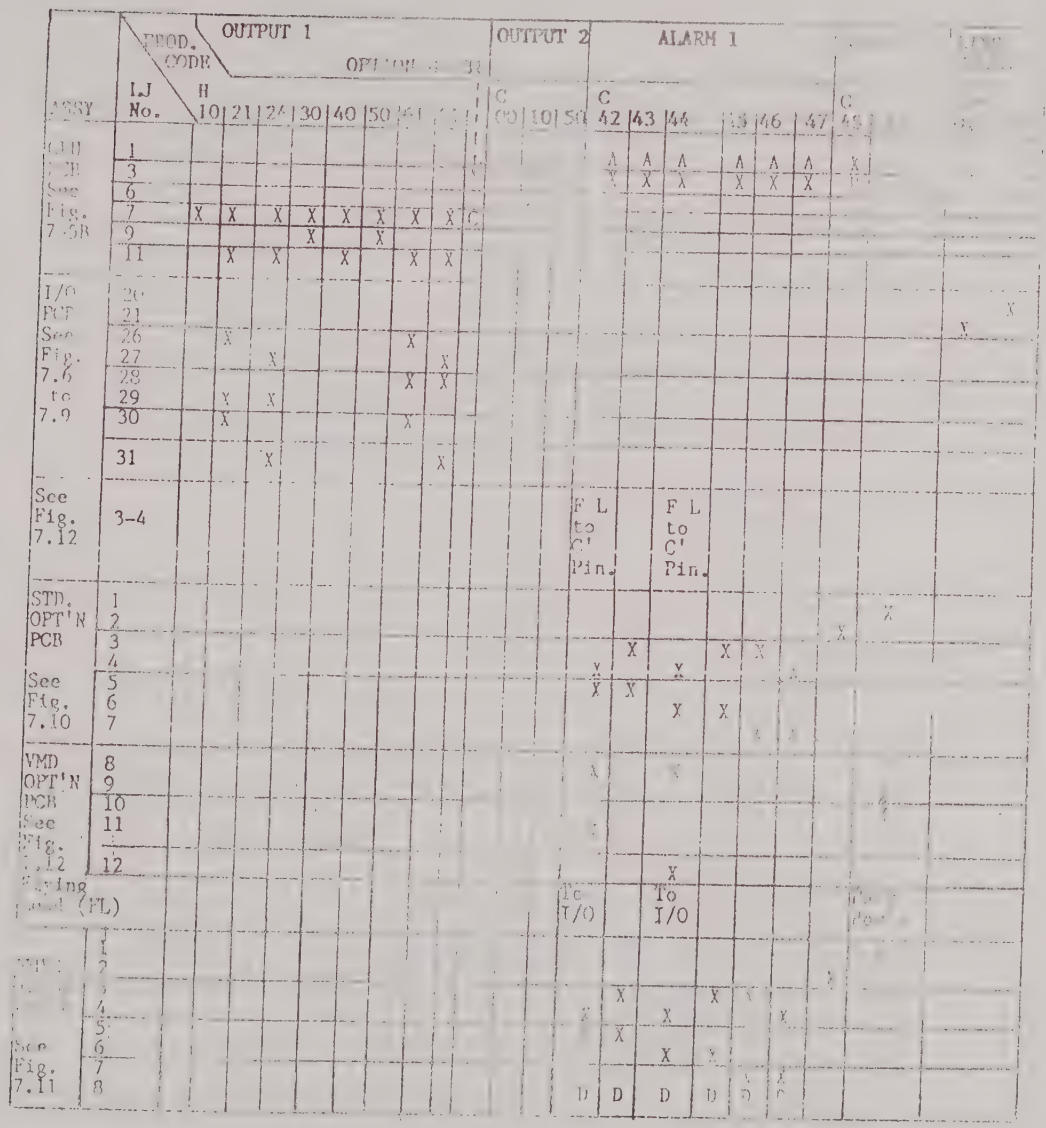
TABLE 7-3 RTD AND [illegible] INPUT - CPU AND INPUT/OUTPUT BOARD LINK JUMPERS

NOTE: W = Wire [illegible]

RE-RANGING & RECONFIGURI

INPUT				CPU LINK JUMPERS						INPUT/OUTPUT BOARD LINK JUMPERS								
PROD.CODE	TYPE	[illegible]	SCALE	14	16	18	20	22	24	5	6	7	12	13	14	17	18	19
T4110	LIN	0-5mV	0-10.00			X		X			X		X					
T4111	LIN	0-10mV	0-10.00			X		X		X					X	X		
T4112	LIN	0-100mV	0-10.00			X		X				X		X			X	
T4210	LIN	0-5mV	0-14.00	X		X		X			X		X					X
T4211	LIN	0-10mV	0-14.00	X		X		X		X					X	X		
T4212	LIN	0-100mV	0-14.00	X		X		X				X		X			X	
T4310	LIN	0-5mV	0-50.00		X	X		X			X		X					X
T4311	LIN	0-10mV	0-50.00		X	X		X		X					X	X		
T4312	LIN	0-100mV	0-50.00		X	X		X				X		X			X	
T4410	LIN	0-5mV	0-100.0	X	X	X		X			X		X					X
T4411	LIN	0-10mV	0-100.0	X	X	X		X		X					X	X		
T4412	LIN	0-100mV	0-100.0	X	X	X		X				X		X			X	
T4510	LIN	0-5mV	0-300.0			X		X			X		X					X
[illegible]	LIN	[illegible]	0-300.0			X		X		X					X	X		
[illegible]	LIN	[illegible]	0-300.0			X		X				X		X			X	
[illegible]	LIN	[illegible]	0-700.0	X		X		X			X		X					X
T4611	LIN	0-10mV	0-700.0	X		X		X		X					X	X		
T4612	LIN	0-100mV	0-700.0	X		X		X				X		X			X	
T4710	LIN	0-5mV	0-1000		X	X		X			X		X					X
T4711	LIN	0-10mV	0-1000		X	X		X		X					X	X		
T4712	LIN	0-100mV	0-1000		X	X		X				X		X			X	
T4810	LIN	0-5mV	0-[illegible]	X	X	X		X			X		X					X
T4811	LIN	0-10mV	0-[illegible]		X	X		X		X					X	X		
T4812	LIN	0-100mV	0-[illegible]	X	X	X		X				X		X			X	

[illegible] (CONTD.) - CPU AND INPUT/OUTPUT BOARD LINK JUMPERS



ASSY	LJ No.	PROD. CODE H	OUTPUT 1 10	21	24	30	40	50	61	OUTPUT 2 C 00	10	50	ALARM 1 C 42	43	44	45	46	47	C 48
CPU PCB See Fig. 7-5B	1												A	A	A	A	A	A	X
	3												X	X	X	X	X	X	
	6																		
	7	X	X	X	X	X	X	X	X										
	9				X		X												
	11		X	X		X		X	X										
I/O PCB See Fig. 7.6 to 7.9	20																		
	21																		X
	26		X					X											Y
	27			X					X										
	28							X	X										
	29		X	X															
	30		X					X											
	31			X					X										
See Fig. 7.12	3-4												F L to C' Pin.		F L to C' Pin.				
STD. OPT'N PCB	1																		X
	2																		
	3												X			X	X		X
	4																		
See Fig. 7.10	5												X	X					
	6														X	X			
	7																		
VMD OPT'N PCB See Fig. 7.12	8												X						
	9														X				
	10																		
	11																		
	12														X				
Parking Load (FL)													To I/O		To I/O				
CPU PCB See Fig. 7.11	1																		
	2																		
	3												X		X	X			
	4													X	X		X		
	5												X						
	6														X	X			
	7																		
	8												D	D	D	D	D	D	

TABLE 7-5 OUTPUT VARIATIONS AND OPTIONS - CPU AND OTHER PCB LINK JUMPERS

NOTES:

1) For CPU link jumpers 14, 16, 18, 20, 22, and 24 see Tables 7-2 [illegible] 4.
2) For I/O range link jumpers 5, 6, 7, 12, 13, 14, 15, 16, 17, [illegible] 34, 35, 36, 37, 38, and 39 see Tables 7-2, 7-3 and 7-4.
3) Table legend:
   - X = Link in
   - Blank = no link or parked
   - A = Insert link 1 if C-- code includes 48 or 49; otherwise park.
   - B = Include link 3 if ALM 1 and ALM 2 are both required. Park if no only ALM 2 is required.
   - C = Park link 7 if option B-31 is required.
   - D = Include link 8 if no alarms or ALM 1 only is required. Leave of both ALM 1 and ALM 2 are required
* For option L04 consult WEST.

7.10 RE-ASSEMBLY OF CONTROLLER

7.10.1 Replace the Option Board (if fitted)

1) Plug in ribbon cable. If the ribbon cable has been removed completely make sure that the contact sides of the ribbon mate with the contact sides of the sockets. Also make sure that both ends are fully inserted.

2) Fix the board to the top plate by inserting screw (See Figure 7-4)

7.10.2 Replace the CPU Board

1) Plug in ribbon cable. If the ribbon cable has been removed completely make sure that the contact sides of the ribbon mate with the contact sides of the sockets. Also make sure that both ends are fully inserted.

2) Align the plug on the board with the socket on the display board and push home.

3) Fix the CPU board to the top plate by inserting screws "D" (See Figure 7-4)

7.10.3 Replace the Bottom Plate

Fix bottom plate plate with four screw "B" (See Figure 7-3) and screw "C" if an option board is fitted.

7.10.4 Replace Front Panel

1) Carefully align the plugs on the front panel with the sockets on the CPU and I/O boards, taking care that the retaining lever at the bottom of the front panel is outside the bottom plate. Then push in the front panel.

2) Insert the four screws "A" shown in Figures 7-3 and

7.10.5 Insert Controller into its Case

1) Make sure that the retaining lever is at 90° to the front panel.

2) Push in the controller carefully but firmly into the housing so that the connections on the PCBs make a good connection with the rear sockets.

3) With the controller fully inserted push the retaining handle to the right until it is flush with the front panel.

APPENDIX 1 PRODUCT SPECIFICATION

INPUT

Input types: thermocouple, R.T.D & D.C. linear
Common Mode Rejection: negligible effect at up to 264V 50/60 Hz
Series Mode Rejection: >1000% of span (at 50/60 Hz) causes negligible effect
Thermocouple Break Protection: upscale or downscale, internally selected
Thermocouple Calibration: complies with BS 4937, NBS 125 & IEC 584 standards
RTD (Pt 100) Calibration: complies with BS 1904 & DIN 43760 standards

OUTPUTS

Output 1

Relay: SPDT contact rating 5A resistive at 120/240V A.C.
Relay Life: $>10^6$ operations
Thyristor Pulse: burst firing, time proportioned synchronised to zero voltage crossover 3.5V minimum at 20mA.
Repetition rate approximately 5K Hz
Valve Motor Drive: interlocked SPDT contacts rated 5A resistive at 240V A.C. (1A inductive).
Slidewire range: 100 to 2500 Ohms
SSR Drive: 0-5V D.C. into 40 Ohms minimum (TTL compatible)
D.C. linear: 0-20mA, 4-20mA, 0-5V, 1-5V. Isolated up to 240V A.C.

Output 2 (optional)

Relay: SPDT contact rating 5A resistive at 120/240V A.C.
SSR Drive: 0-5V D.C. into 40 Ohms minimum (TTL compatible)

Alarm 1 (optional)
Relay: SPDT contact rating 2A resistive at 120/240V A.C.
Relay life: $>10^6$ operations.

Alarm 2 (optional)
Relay: SPDT contact rating 2A resistive at 120/240V A.C.
Relay life: $>10^6$ operations

CONTROL

Self-tune and Pre-tune facility:
Automatic control of: Proportional band
Reset (Integral) time
Rate (Derivative) time
Relative gain of Output 2

PRODUCT SPECIFICATION

Proportional Band: 0.5 - 9.9% at 0.1% resolution
10 - 100.0% at 1% resolution and ON/OFF
Cycle Time: Relay outputs 2,4,8,16,32 or 64 seconds
SSR drive outputs 0.25, 0.5, 1, 2, 4, or 8 secs
Reset (integral) time: 1 second - 99 minutes 59 seconds and OFF
Rate (derivative) time: 0 - 99 minutes 59 seconds
Deadband/Overlap: +20% to -20% of proportional band
Relative Gain of Output 2: 0.01 to 1 and OFF (giving ON/OFF control

ENVIRONMENT

REFERENCE CONDITIONS

Ambient Temperature: 20°C (±2°C)
Supply Voltage: 120/264V (±1%) 50/50 Hz
Thermocouple Resistance: <10 ohms
RTD (Pt 100) Resistance: <0.1 ohm per lead
Relative humidity: 60 to 70%

OPERATING CONDITIONS

Ambient Temperature: 0-50°C operating
-20 to +80° storage
Supply Voltage: 193-264V, 100-132V or 24V, 50/60
Maximum Source Resistance: Thermocouple <1000 Ohms
RTD (Pt 100) <100 Ohms per l
(equal resistance in each lead)

PERFORMANCE

Reference Accuracy: ±0.25% of span ±1 LSD
Temperature Stability: 0.01% of span for 1°C change in ambient temperature
Cold Junction Compensation: <0.075°C change for 1°C change in ambient temperature
Effect of thermocouple resistance: <0.1% of span error for resistance 0 to 100 Ohms
Effect of RTD lead resistance: <0.5% of span error for up to 50 Ohms lead resistance
Supply Voltage Influence on Accuracy: negligible effect within operating range

GENERAL

Digital Display: 4 digit 7 segment LED display
Deviation Display: 7 bar LED with 2 settings - coarse: ±5%
- fine: ±2.5%
Dimensions: 3.8" x3.8" x 8.7" (96mm x 96mm x 210mm)
Weight: 4.4 lbs (1.65kg) approx
Front Panel Protection: IEC 144 IP 54
Power Consumption: 9V VA appro
Parameter and Data Retention: Lithium battery, 5 years typical.

APPENDIX 2: PRODUCT CODE

The instrument Product Code is located on the top plate of the instrument case.

M2071 L02 T1418 H1 H2 C1 C2 X20

MODEL	CODE
European	M1071
U.S.A.	M2071

LINE VOLTAGE	CODE
220V & 240V nominal supply	L01
110V & 120V nominal supply	L02
24V nominal supply	L04

INPUT	CODE
Thermocouple*	
R 0-1650 degrees C, Pt 13%/Rh	T1127
32-3002 degrees F, Pt 13%/Rh	T1128
S 0-1650 degrees C, Pt 10%/Rh	T1227
32-3002 degrees F, Pt 10%/Rh	T1228
J 0.0-205.0 degrees C, I/C	T1415
32.0-401.0 degrees F, I/C	T1416
0-450 degrees C, I/C	T1417
32-842 degrees F, I/C	T1418
0-760 degrees C, I/C	T1419
32-1400 degrees F, I/C	T1420
J (DIN) 0.0-205.0 degrees C	T1815
32.0-401.0 degrees F, I/C	T1816
0-450 degrees C, I/C	T1817
32-842 degrees F, I/C	T1818
0-760 degrees C, I/C	T1819
32-1400 degrees F, I/C	T1820
T -200 to +260 degrees C, Cu/Con	T1525
-328 to +500 degrees F, Cu/Con	T1526
K 0.0-205.0 degrees C, C/A	T1715
32.0-401.0 degrees F, C/A	T1716
0-600 degrees C, C/A	T1721
32-1112 degrees F, C/A	T1722
0-1371 degrees C, C/A	T1723
32-2500 degrees F, C/A	T1724

*Upscale thermocouple break protection is fitted as standard. If downscale break protection is required, suffix the above code with 21, e.g.T172421. If no break protection is required, use suffix 22.

PRODUCT CODES

3 Wire RTD Pt100	CODE
-101.0 to +100.0 degrees C	T2230
-150.0 to +212.0 degrees F	T2231
-200.0 to +205.0 degrees C	T2232
-328.0 to +401.0 degrees F	T2233
0 to 600 degrees C	T2221
32 to 1112 degrees F	T2222

Linear**	CODE
0-5mV	T4-10
0-10mV	T4-11
0-100mV	T4-12
0-20mA	T3-13
4-20mA	T3-14

**The second digit of this code should be chosen from the table below.

LINEAR INPUT DISPLAY SCALE	CODE
0.00-10.00	-1--
0.00-14.00	-2--
0.00-50.00	-3--
0.00-100.0	-4--
0.0-300.0	-5--
0.0-700.0	-6--
0-1000	-7--
0-3000	-8--

OUTPUT 1 (e.g. HEAT)***	CODE
Relay	H10
D.C. current 4-20mA	H21
D.C. current 0-20mA	H24
Thyristor pulse	H30****
Valve motor drive	H40*
SSR drive	H50
D.C. voltage 1-5V	H61
D.C. voltage 0-5V	H64

***Output 1 is supplied as reverse acting. If direct acting output 1 is required, suffix the above code with 31, e.g. H1031.

****Instruments fitted with Thyristor pulse output are not available with output 2.

*Instruments fitted with VMD output are not available with output 2, or with more than one alarm. This alarm is fitted as standard. The available alarm options are limited to the following.

ALARM OPTION (VMD INSTRUMENTS)	CODE
High deviation - direct acting	C0042
Low deviation - direct acting	C0044
Process alarm - reverse acting	C0049

OUTPUT 2 (e.g. COOL)****	CODE
Relay	C10
SSR drive	C50
Not fitted	C00

NOTE: Output 2 action is always the opposite of output 1 action.

****A choice of alarms is available which may be selected by suffixing the above code with the options shown below:

ALARM 1	CODE
High deviation - direct acting	42
High deviation - reverse acting	43
Low deviation - direct acting	44
Low deviation - reverse acting	45
Limit comparator - relay energised within band	46
Band alarm - relay energised outside band	47

ALARM 2	CODE
Process alarm - direct acting	48
Process alarm - reverse acting	49

Where Alarm 1 and Alarm 2 are both included, the Alarm 2 code follows the Alarm 1 code, e.g. C104248.

OPTIONS	CODE
RS422 serial communication	X02

APPENDIX 3 – REPLACEMENT ASSEMBLIES – OPTIONS AVAILABLE

INPUT/OUTPUT PCB ASSEMBLIES

Input	Output	Product Code
Thermocouple	Relay	M9070 T10 H10
RTD (3 wire)	Relay	M9070 T20 H10
D.C. current	Relay	M9070 T30 H10
D.C. voltage	Relay	M9070 T40 H10
Thermocouple	D.C. for SSR	M9070 T10 H50
RTD (3 wire)	D.C. for SSR	M9070 T20 H50
D.C. current	D.C. for SSR	M9070 T30 H50
D.C. voltage	D.C. for SSR	M9070 T40 H50
Thermocouple	D.C. Linear (mA/mV)	M9070 T10 H20
RTD (3 wire)	D.C. Linear (mA/mV)	M9070 T20 H20
D.C. current	D.D. Linear (mA/mV)	M9070 T30 H20
D.C. voltage	D.C. Linear (mA/mV)	M9070 T40 H20
Thermocouple	VMD	M9070 T10 H40*
RTD (3 wire)	VMD	M9070 T20 H40*
D.C. current	VMD	M9070 T30 H40*
D.C. voltage	VMD	M9070 T40 H40*
Thermocouple	Thyristor Pulse	M9070 T10 H30**
RTD (3 wire)	Thyristor Pulse	M9070 T20 H30**
D.C. current	Thyristor Pulse	M9070 T30 H30**
D.C. voltage	Thyristor Pulse	M9070 T40 H30**

OPTION PCB ASSEMBLIES

Alarm 1 only	M9070 C0053
Alarm 2 only	M9070 C0054
Alarm 1 and Alarm 2	M9070 C0055
Output 2 (Relay) only	M9070 C10
Output 2 (Relay) and Alarm 1	M9070 C1053
Output 2 (Relay) and Alarm 2	M9070 C1054
Output 2 (Relay), Alarm 1 and Alarm 2	M9070 C1055
Output 2 (D.C. for SSR) only	M9070 C50
Output 2 (D.C. for SSR) and Alarm 1	M9070 C5053
Output 2 (D.C. for SSR) and Alarm 2	M9070 C5054
Output 2 (D.C. for SSR), Alarm 1 and Alarm 2	M9070 C5055
Output 1 (VMD) including Alarm	M9070 C40*
Output 1 (Thyristor Pulse) only	M9070 C30**
Output 1 (Thyristor Pulse) and Alarm 1	M9070 C3053**
Output 1 (Thyristor Pulse) and Alarm 2	M9070 C3054**
Output 1 (Thyristor Pulse), Alarm 1 and Alarm2	M9070 C3055**

* Option PCB assembly (Code C40) must always be used with the appropriate I/O assembly, to provide VMD output 1. It is not compatible with any other option.

** Option PCB assembly (Code C30 or C30--) must always be used with the appropriate I/O assembly, to provide Thyristor Pulse output 1. It is not compatible with any other output option.

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